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PUBLIC HEALTH REPORTS

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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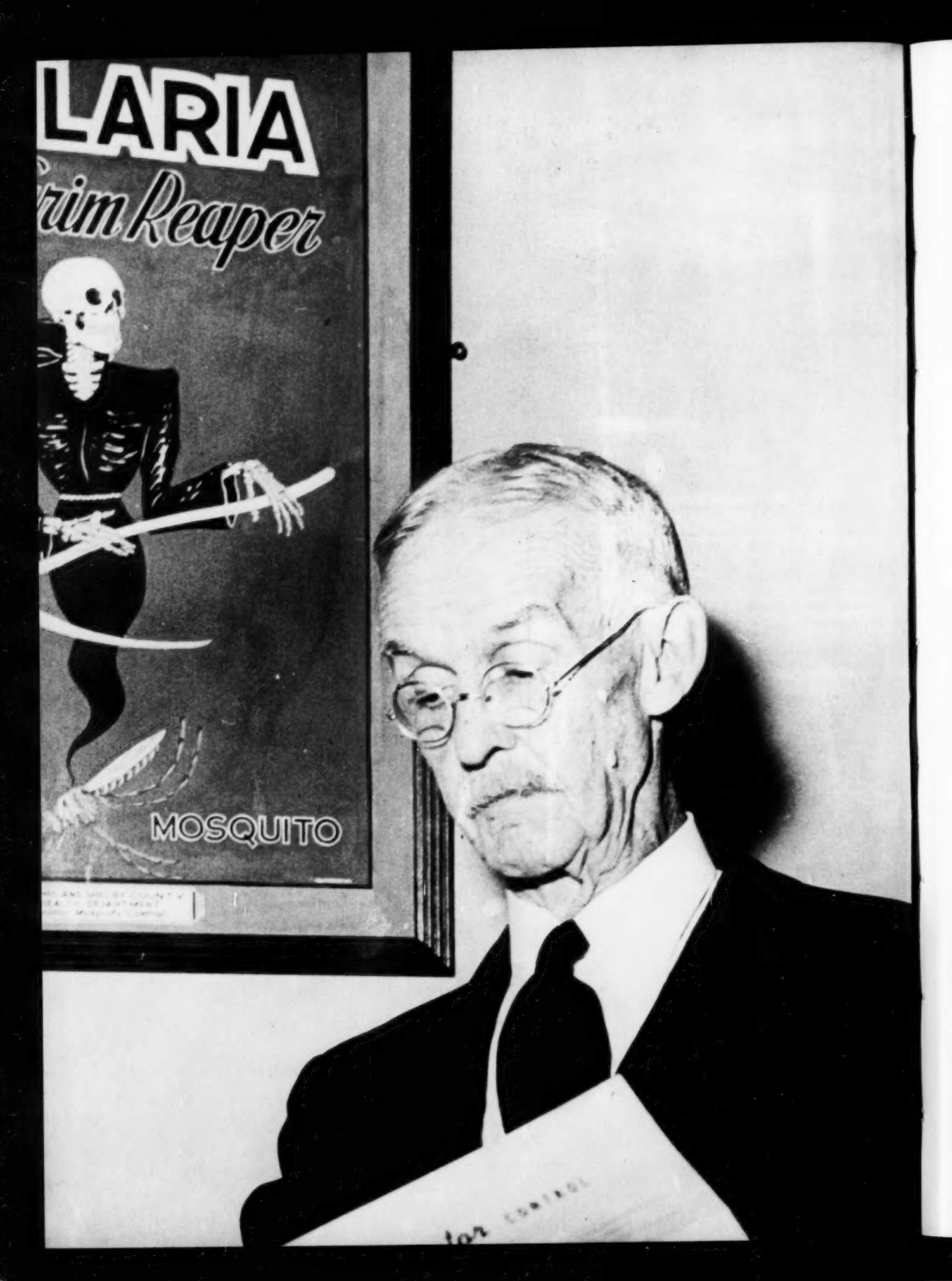
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PUBLIC HEALTH REPORTS

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
MARION B. FOLSOM, *Secretary*

PUBLIC HEALTH SERVICE

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Feminine-maternal traits, emotional stability, tolerance, and mature response to aggression or infantile conduct are among the assets to look for in nurses assigned to the care of excessive eaters and drinkers. Psychological studies offer guidelines for identifying suitable personality traits in candidates for nursing nutritional deviants.

Nurses for Alcoholics

By GIORGIO LOLLI, M.D.

THE number of hospital wards, sanatoriums, nursing homes, and clinics devoted to the care of alcoholics is growing steadily with the realization of the contemporary magnitude of this problem and the improved methods of diagnosis and treatment. At the same time the importance in our culture of other deviations in nutritional habits, such as obesity and leanness, is gaining increasing medical attention.

The establishment of facilities for the treatment of deviations in eating or drinking has naturally created a demand for qualified professional personnel. The personality traits of nurses to be assigned to services of this type are of particular consequence.

The serious responsibilities attendant upon ministering to the sick call for painstaking care in the selection and assignment of all nursing personnel. Hospital executives in the past had to rely, and not without considerable success, on their empirical experience and intuition for guidance in this function. The trend now, however, is toward application of sound and proved psychodynamic principles to the appraisal of nurse candidates. But still more can be achieved if selection is geared to the needs of treatment teams working with special classes of patients.

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My discussion, therefore, centers on the importance of the emotional makeup of nurses to be assigned to a service devoted to the correction of deviant eating and drinking habits in which the approach is simultaneously medical, psychological, and social.

The extension of these principles to other types of clinical services, it is hoped, will be self-evident.

The emphasis on interactions between the nurse and the alcoholic patient should be construed only as an expression of the belief that the nurse who is able to deal adequately with the alcoholic can also deal appropriately with all patients regardless of the condition for which they need nursing care. When sick, all individuals to a certain extent revert to infantile patterns of behavior. The understanding and handling of this behavior is facilitated by knowledge about alcoholism—a condition which results from the eruption of infantile traits in adult age.

Finally, it is assumed that the importance of the nurse's professional qualifications is universally granted and needs no further emphasis here.

The suggested criteria represent an ideal conception of the nurse qualified to work in a service for eating and drinking deviants. But even if ideals seldom, if ever, can be attained in full, our constant goal should be to approach the model.

A systematic evaluation of the emotional as-

sets and liabilities of the nurse prior to her assignment to a particular service will weed out some candidates who would affect and be affected unfavorably by the institutional group. Of course, evaluation must continue after the nurse becomes a member of the staff. It should be an endless and creative process of mutual criticism wherein the appraisal of the newcomer by the older members is not more important than her appraisal of the group. Final decisions about long-term employability should be taken only after several months of trial.

Certainly nurses, like other members of the human race, cannot be expected to be without emotional inadequacies. However, some difficulties which are not necessarily handicaps in other professions or occupations might present a serious threat to a satisfactory nurse-patient relationship.

The emotional problems which represent a handicap in a nurse assigned to a service for deviant eating and drinking habits usually are deeply rooted and difficult to alleviate or solve. The illusion that personality changes may occur as a result of learning experiences with staff members or with patients should not be fostered. In a service of this type, time is seldom available for entirely adequate treatment of the patient. Time is never available for more than a superficial approach to the emotional difficulties of members of the staff. On the other hand, emotional problems of the staff may be swiftly magnified, or change from latency into open manifestations, as a result of exposure to an emotionally disturbing environment.

In the selection and evaluation of nurses, the concept of "compatible neuroses" is a practical one. When a new nurse is employed the composition of the staff as a whole should be kept in mind. It is desirable to visualize what effects the new member of the team will have on the older ones. For instance, some obvious handicaps in a nurse supervisor can be tolerated if other members of the team do not exhibit similar traits or are not too sensitive about them.

Excessive drinking, excessive eating, and deviant nutritional habits in general are linked with the very dawn of emotional life. Through the first nutritional experiences the first social experiences of the adult-to-be take place. Adequate hunger-linked emotions are those of love, warmth, and mutual tenderness. The inadequate ones are those of hate, violence, and resentments in general. A mutually rewarding mother-child relation favors the development of adequate hunger-linked emotions. Conversely, an unsatisfactory mother-child relation has untoward repercussions unless outweighed by later and more favorable experiences.

When psychological and social techniques are applied to problems of nutrition and nutritional habits, uncontrollable emotions often flare up quickly and violently not only in patients but also in emotionally ill-equipped therapists. The reason for this is that the emotions linked with deviant nutritional habits are antisocial in their nature. Indeed, it may be that unconscious fears related to these emotions account for the paucity of attention given thus far to the psychological and social aspects of hunger and of nutritional habits in general.

Physical Characteristics

In a general hospital, the nursing staff of a service for nutritional deviants should be limited to women. A general hospital has male attendants available if necessary for security. Experience has shown that with properly trained and emotionally fit women nurses, with medication administered promptly and adequately, and with a response to violence which emphasizes firm and fearless tolerance, the need for restraints and for the use of force in general is practically nil.

The limitation to women nurses is based on the crucial role played by women in bringing up children, as known from time immemorial and confirmed by scientific research during recent decades. While unsatisfactory mother-child relations contribute to all cases of adult maladjustment, they are especially decisive in those directly linked to deviant nutritional habits. Conversely, healthy emotional experiences with adequate women may help to alleviate or wipe out the painful pressure of half-buried experiences with the woman who is of paramount importance in the life of every human being. This stress on the significance of an unhealthy mother-child relationship should not be construed as "criticism" of the mothers of

patients or of the patients themselves. It is simply a recognition of the fact that inadequacies of the mother-child team have far-reaching consequences.

The marital status of the nurse seems unimportant. There are countless single women who display clear-cut feminine personality characteristics, objective attitudes toward sexual behavior and its deviations, and ability to participate in a variety of mutually rewarding social relations. Because healthy attitudes toward sex problems are often entirely unrelated to sex experience in real life, inquiries about sex life are seldom important for evaluation. Such inquiries may rather be symptomatic of the problems of the interviewer than evocative of those of the candidate.

It follows that marriage or sex experience does not make feminine a woman who is not so from the start; nor will either or both solve sexual problems. The presence or absence of sexual difficulties stems psychodynamically from the presence or absence of maladjustment in the area of hunger-linked emotions. This is why problems connected with distortions of the ability to love, to relate to people, to be tender, to express warm feelings appear to be of fundamental significance.

The age of the candidate is of secondary importance, provided she is in excellent physical health.

Shared Handicaps

In a service devoted to deviant eating and drinking habits, excessive drinking and marked overweight or underweight represent obvious handicaps. Moderate overweight or underweight can be tolerated if the nurse is able to accept possible criticism from patients about her "weakness" and to use the handicap as a veiled indication that she is "not different." One of the main difficulties of the neurotic patient is his feeling that he is "different." He sometimes feels encouraged by seeing that other people who have achieved some measure of success in life also exhibit handicaps similar to his own.

If her language is clearly intelligible, a foreign accent should not disqualify a candidate. In many cases, the neurotic patient feels himself a "stranger" or "estranged." Contact with another "stranger" may be emotionally helpful. People sometimes share with a traveling companion, a stranger, facts and feelings which they could not share with a close friend.

The ability to express herself clearly in writing, however, is important for the nurse because of the great value of her observations, which should be recorded in detail.

With these possible exceptions, however, it must be remembered that in a professional nurse-patient relationship the emphasis should be on shared assets rather than on shared handicaps.

All that has been said thus far in no way attenuates the importance of basic professional and technical training. In addition, some knowledge or at least some specific interest in nutrition and dietetics is desirable since the attitude of the deviant patient toward food often supplies revealing clues to his emotional life.

Psychodynamic Principles

It is advisable that a candidate be interviewed separately by two members of the staff whose training and experience allow them to base an evaluation of the nurse's assets and liabilities on sound psychodynamic principles.

The following questions may be considered as a general guide for interviewers but are not intended to be used as an interview outline.

Has the candidate ever had any problem connected with the excessive use of alcohol or drugs? If so, a thorough psychiatric evaluation should be conducted before a decision is taken, even if the addiction to alcohol or drugs is no longer active. The rule that persons presently addicted to alcohol or drugs should not be considered for a position in a service specializing in eating and drinking deviations has no exceptions. For persons who were addicted to alcohol or drugs in the past, this rule could have some exceptions which only a thorough personality study of the candidate may justify.

The emotions linked with excessive use of alcohol or of drugs and those linked with nutritional deviations in general tend to be explosive. These are the emotions whose distortions lead to a variety of serious individual and social disorders, besides alcoholism or drug addiction.

Persons suffering from these emotional turmoils often have their problems fanned by exposure to patients suffering from similarly distorted emotional constellations.

The experience of Alcoholics Anonymous, an association of former excessive drinkers who help each other to keep sober, might seem to contradict this viewpoint. A deeper examination of the difference between a therapeutic relationship with patients and fellowship in Alcoholics Anonymous will prove that no such contradiction exists.

The attitude toward Alcoholics Anonymous of any service dealing with alcoholic patients should be friendly and cooperative, giving full recognition to the great contribution of this movement to the alleviation of the problem of alcoholism.

In most cases the professional therapeutic approach to the alcoholic patient is compatible with the activities of Alcoholics Anonymous. Thus, with exceptions based on psychiatric contraindications, the alcoholic patient should be encouraged to participate in the movement. Nevertheless, the fundamental differences between a professional and a nonprofessional approach must never be lost to sight. It is true that all professional as well as lay methods used to control alcoholism are based on the same process: Emotional energies tied to physical disability, psychological inadequacies, and social maladjustment, or a combination of these disorders, are liberated through the alleviation or correction of the handicaps and then used to keep the urge to drink in check. But professional approaches and the Alcoholics Anonymous method differ quite markedly in the degrees of alleviation and correction of the medico-psycho-social handicaps and even more in the techniques of achieving such alleviation or correction.

The members of a professionally trained treatment team should approach the alcoholic, as all patients, on the fertile ground of common humanity. The lines of communication with him are tacitly sustained by the assets shared with him. While the therapists take their own liabilities for granted, they do not share them with the alcoholic beyond the implicit admission of their existence.

To try to cooperate with the alcoholic on a professional level calls for a variety of assets in the nurse. She must be able to direct an abundant, flexible, and timely flow of emotions to those areas of her personality which are challenged by the alcoholic's difficulties. For example, there is need for large emotional reserves so that the response to aggression will be tolerance, so that the wounds inflicted by hate will be healed without excessive challenge to the nurse's proper attitude. In the ideal attitude, the nurse's wishes and her ethical duties should coincide.

Emotional reserves are not ample in the alcoholic. The nurse addict is no exception even if her abstention from alcoholic beverages has been of reasonably long duration, because she needs these emotions to keep in check her own addictive urge. This situation makes it difficult for her to deal with alcoholics on a professional basis.

The alcoholic nurse, like any other addict, is able to deal with and help her fellow alcoholics on a nonprofessional basis. This is shown decisively by repeated experience in Alcoholics Anonymous, where the line of therapeutic communication between members is sustained by the shared conscious experience of a handicap (namely, addictive drinking) and by the shared unconscious experience of those guilt-laden emotions which lead to addiction. The fact is that less emotional energy is required by the alcoholic to abstain in Alcoholics Anonymous than to refrain from drinking in response to professional treatment. The more economical achievements of Alcoholics Anonymous result from the circumstance that within the framework of the movement the addictive urge to drink is kept in check by mutually potentiating group emotions whose pressure is concentrated intensely—sometimes violently—on the interplay of the two opposites: inebriety and sobriety.

A sound and adequate professional approach, on the other hand, leads to an ampler expansion and to a greater flexibility of the alcoholic's personality. The outcome is deeper: a less rigid acceptance of life in general and a more secure attitude toward the lifelong liability connected with the alcoholic problem in particular.

As already noted, professional and Alcoholics Anonymous approaches are compatible and

their combination is advisable in many cases of alcoholism. In combined approaches, the abstention from alcohol achieved and maintained in Alcoholics Anonymous does not drain the alcoholic's emotions drastically and enables him to face a professional approach with greater chances of personal improvement.

But this fact must be borne in mind: While the alcoholic can "receive" profitably a combination of professional and nonprofessional help, only exceptional persons can give professional and nonprofessional help to the alcoholic at the same time. Yet this is the dangerous situation faced by a professional nurse who is an alcoholic in working with alcoholics as patients.

Whether or not she is a member of Alcoholics Anonymous, she is bound to share her liability with the alcoholics she nurses, either on a conscious or on an unconscious level. From this viewpoint, therefore, her line of communication with alcoholics is not professional. Yet in nursing duty she must try to establish a professional line of communication which, because based mostly on personal assets, calls for large amounts of free emotional energies. Repeated observation indicates that the nurse's attempt to reconcile professional and nonprofessional attitudes has a high liability to failure. In all likelihood, this attempt adds a new conflict to the old ones, with renewed drain on the nurse's emotional reserves. When dutybound to act professionally, either her defenses against the urge to drink weaken or an ill-concealed nonprofessional attitude takes the place of professional nursing. Dangers then arise for the alcoholic nurse as well as for the alcoholic being nursed.

The following propositions, based on fundamental principles of mental economics, summarize the above discussion:

1. In Alcoholics Anonymous and in some other lay approaches, the individual member gives the alcoholic as much help as he receives. The success of treatment is based on this equilibrium.

2. In a professional relationship, the therapist must be able and willing to give much and to receive nothing. The maintenance of the emotional equilibrium of professional personnel is the outcome of interactions between these individuals and society at large, with resulting availability of large emotional reserves for treatment purposes.

3. An alcoholic nurse, even if long sober, almost constantly faces difficulties in tolerating a situation of disturbed equilibrium in which the help she should give far exceeds what she receives.

These statements should not be construed as an attempt to demonstrate the superiority of professional treatment and professional personnel. Their aim is solely to clarify the differences between professional and lay approaches.

What is the candidate's attitude toward the emotional problems of patients? Extremes of excess interest and disinterest are equally undesirable. The adequate nurse seldom tries to elicit from patients conversation relating to emotions. However, patients often talk to her. She should be able to interrupt "confessions" which, almost intuitively, she senses to be damaging to the patient's emotional stability, insofar as the patient will later regret disclosures made in a state of turmoil.

The emphasis on emotional problems, so obvious in contemporary societies, can lead to an attitude characterized by almost total denial of body illness. The "it's all in your mind" type of nurse is not particularly helpful to patients. It hints of a grandiose and rather primitive conception of the powers of the human mind. To be aware that body and mind interact does not mean that disturbed emotions are the exclusive cause of body disorders, and certainly the nurse should not promote such an impression.

Is the candidate interested in bedside nursing? Some nurses are attracted by the scientific aspects of nursing, by theoretical discussions, and by administrative functions only because they are basically inhibited with patients. They are unable to be close to them, touch them, and so forth. Such attitudes are indicative of emotional problems which, related as they are to underlying deviant nutritional habits, are not compatible with the proper nursing of patients on a service specializing in these very problems.

Does the candidate have strong feelings of inferiority (or superiority) about the practice of nursing in comparison with the practice of internal medicine, or psychiatry, or social work?

An unrealistic hierarchical conception of professions is the symptom of unsolved intellectual and, sometimes, emotional problems. The well-trained nurse has her rightful place in a therapeutic team on an equal basis. The best qualified nurse understands the nature of this equality.

Does the candidate believe that there are higher or lower activities in nursing? The good nurse has no such illusions. The handling of a bedpan is not an activity of a "lower" quality than some administrative functions. The quality of a function is determined by the training brought to it and by the emotional attitude toward it. Strivings for power which are incompatible with ministering to the sick often underlie concepts relating to higher or lower activities in nursing and in professions in general.

Has the candidate ever worked in close cooperation with social workers? If so, has she gotten along well with them? How does she feel about social workers in general? If she has not teamed with social workers in the past, is the likelihood of good cooperation apparent?

The profession of social work has gone through changes as radical as those observed in the profession of nursing in recent years. From the handling of some apparently simple social problems, social workers have shifted their attention in part to the emotional problems of the individual. The experience thus gained has deepened their insights into the social maladjustments which are the projection of inner inadequacies. Experience has shown that an approach to social difficulties based on sound psychodynamic principles can supply to the disturbed person those corrective emotional experiences which may affect his inner equilibrium favorably and durably.

The cooperation between nurse and social worker is most helpful to any patient in the hospital and outside. In the eyes of the alcoholic, for example, the nurse often represents the temporary shelter and security of an unreal world. The social worker, on the other hand, represents the harsh realities of day-by-day life. This seems to be one reason why so many hostilities are still polarized against the social worker. The emotional ambivalence toward maternal figures which governs the lives of so many neurotic individuals, alcoholics among them, often expresses itself with love for the nurse and hostility to the social worker. The nurse is often in a position to interpret the social worker to the alcoholic. Furthermore, the nurse, exposed more than any other professional person to the exhausting challenges of the alcoholic, often needs the emotional support, as well as the technical interpretation of the nurse-alcoholic relationship, which a skilled psychiatric social worker can supply.

How does the candidate envisage the specific role of the nurse in the prevention or alleviation of the emotional difficulties of patients? There is growing psychodynamic evidence that the main factor underlying emotional stability is a healthy and mutually rewarding mother-child relation. Regardless of her age, the nurse plays a maternal role for all patients and should be endowed with maternal traits. According to this viewpoint, maternal traits should be considered almost identical with feminine traits, and they are not dependent on the actual experience of motherhood. They are to be understood as the ability to tolerate and to interrupt betimes other people's pleasures and also their pains. The good mother is the one who knows how and when relief should be given to the child's pain; she knows also how and when the child's pleasures should be interrupted. In other words, she should be able to tolerate some pain in her child without guilt feelings and some pleasure without envious feelings. Besides these traits, emotional and physical stability, plus predictability of reactions to a given situation, should be considered maternal traits.

Does the candidate prefer male or female patients? There is little doubt that the ideal nurse should be maternal enough not to have preferences for male or female patients.

How would the candidate react to attempts by patients to get information about her personal life? The ability not to disclose too much about her personal life is of great importance. Usually it is linked with the ability to give some

harmless information about herself. In her contacts with the patient, the nurse should be able to keep control of the questions asked of her. This ability is definitely linked with her respect for other people and with her self-respect.

What is the candidate's attitude toward success or failure? Persons whose emotional constellations are similar to those operative in alcoholism and in other deviant nutritional habits often have a kind of "all or nothing" attitude toward success and failure. A minor error represents total failure and, conversely, a minor achievement might be fantastically magnified into a major success. The ability to see these matters in their proper perspective is best suited to the nursing of patients of this type.

How does the candidate react to aggression? Completely passive and completely aggressive reactions are equally undesirable if present all the time. Of course, occasional passivity or aggression are part and parcel of human nature. When required by the welfare of the patient, a nurse should be able to enforce discipline without experiencing guilt. Her actions should be guided by reason and not precipitated by the overwhelming pressure of her aggressive emotions.

Does the candidate exhibit harmless infantile traits? The ability to be a child occasionally and to interrupt the often painful performances of adult behavior should not be considered a handicap. Brief expressions of harmless infantile traits may greatly help a nurse to control those infantile traits which are harmful. The upbringing of many disturbed adults, among them the alcoholics, was highlighted by parental or cultural attitudes pointing to natural childhood behavior as basically "wrong" and leading to repression of harmless infantile traits.

What is the candidate's attitude toward hierarchical transmissions of authority and nonphysical violence from top to bottom? There is little doubt that authority and violence are often, even though wrongly, linked together and that retaliation for authoritarian attitudes of superiors is meted out to persons inferior in rank and, eventually, to patients. The ideal nurse should be able to block violence at her level and to act more as a buffer than as a catalyst.

Can the candidate distinguish between a friendly attitude toward a patient and being "friends" with the patient? Can she keep sufficiently close to him and at the same time sufficiently distant from him? In a service for deviant eating and drinking habits, many patients are in good physical condition 2 or 3 days after their admission. They tend to become "friends." They attempt to engage the nurse in a close relationship which is dangerous both to them and to the nurse. The latter must have the skill to maintain the relationship on a professional level.

Does the candidate apply the disease concept to alcoholism and obesity? The alcoholic and the obese are suffering as a result of their search for excessive and forbidden pleasures. The disease connotation of their predicament is unusual insofar as the concept of disease is customarily linked with the concept of pain. Sooner or later persons in contact with alcoholics and obese individuals sense—consciously or unconsciously—that a search for forbidden and excessive pleasures, much more than overwhelming pain, is at the root of the trouble. Some professional people, nurses included, cannot accept without resentment the excessive pleasures of the addicts and react with ill-disguised hostility to the realities of the situation.

Is the candidate tolerant of the patient's lack of cleanliness? Alcoholics, especially in the early days of their hospitalization, are often unclean and unwilling to be clean. Sometimes this attitude is followed by an obsessive search for cleanliness. There is a type of woman, observed often in our culture, who was brought up with an obsessive repulsion against all that is not perfectly clean. She might feel "soiled" by the sexual experiences of marriage, and as a young mother she might be repelled by the soiled diapers of her baby. While this is not the place to discuss how and why this attitude develops, it can be stated that a rather tolerant attitude toward lack of cleanliness and an equally tolerant attempt to correct it are es-

sential in the nurse assigned to patients on a service for nutritional deviants.

Is the candidate sensitive enough to the emergent needs of the neurotic to be able to satisfy them quickly if required? Is she able to interrupt his pain swiftly when it appears to be overwhelming? On the other hand, is she free enough of impulsive traits to be able to delay the interruption of pain when it seems justified to do so in terms of long-range therapeutic plans? The attitudes explored by these questions are linked with the previously discussed maternal traits.

Is the candidate so secure as to be able to discuss her inadequacies with colleagues and superiors? If unable to cope with a given situation or with a given patient, is she able to delegate the task to a colleague? These admissions of individual shortcomings can occur only within a well-integrated and smoothly operating therapeutic team, where mutual respect is based on technical competence but even more on high standards of morality and of emotional adequacy.

Can the candidate correctly interpret sexual or apparently sexual proposals by patients? There is little doubt that some patients react to nurses with the most childish side of their personalities. Sometimes they try to touch them, eager for a physical contact which is more that of the child with the mother than of the man or woman with another adult woman or man. The correct interpretation of these attitudes is fundamental and should lead to tolerance not free from firmness.

Is the candidate willing and able to give the patient all the explanations necessary to make clear the apparently mysterious ways in which a service of this type operates? Is she a good listener? Because of the attempt to elicit corrective emotional experiences, the attitude of the treatment team often differs radically from all attitudes to which patients had been exposed in the past. Thus the service and the actions of its personnel are often interpreted as puzzling and mysterious. Nurses should have the ability to clarify misunderstandings and define treatment goals. They should be able to listen with poise to the patient's excessive praise or criticism of other members of the therapeutic team, and be free to convey to colleagues and superiors the patient's feelings about them so that treatment may be modified accordingly.

Summary

Services devoted to patients with deviant eating and drinking habits, separately or in combination, are growing in number. The professional nurse is a most important member of the therapeutic team in such services. Available are psychodynamic principles which should be applied to the evaluation and selection of nurse candidates for services of this type.

The specific criteria suggested are intended to help in identifying both suitable and unsuitable emotional traits in the nurse seeking assignment to such a service. The chief guiding principle is that the nurse should be a woman able to function as a symbolic feminine-maternal figure. This is based on the observation that patients with deviant eating and drinking habits usually experienced some disturbance in the early mother-child relationship, with resulting distortion of hunger-linked emotions, and that this maladjustment can be alleviated through healthy emotional contacts with adequate woman figures.

Among the most desirable specific characteristics, therefore, are: stable emotional makeup; feminine-maternal traits (not dependent on age or sexual experience); ability to cooperate in a treatment team with social workers particularly; acceptance of the patient's condition, in spite of its origin in pleasure-seeking activities (eating, drinking), as one requiring professional treatment; and ability to respond to the patient's occasional need for immediate relief from pain, or occasional aggressive and infantile conduct, without counter aggression and with appropriate mature behavior.

Nurse candidates who themselves have experienced addiction to alcohol or drugs require special psychiatric evaluation.

Payments by the State welfare agency for clients needing care in nursing or boarding homes lag behind actual costs, and this, in turn, keeps many such homes from improving their standards to meet the State health agency requirements.

Costs of Care of Aged and Infirm Residents in Florida Nursing and Boarding Homes

By FERNE HOBSON BRITT, R.N., and MARGARET H. JACKS, A.B.

COSTS OF CARE in nursing and boarding homes for the aged and infirm were studied cooperatively by the Florida State Department of Public Welfare and the Florida State Board of Health in January, February, and March 1955. Both departments are interested in the development of adequate resources to care for persons whose physical and medical needs cannot be met in their own homes.

The Florida State Board of Health was given the legal responsibility of licensing and maintaining standards in nursing and boarding homes for the aged and infirm in 1953. Many of the residents in such homes receive aid through one of the public assistance categories administered by the Florida State Department of Public Welfare. Both agencies and the general public were aware that the licensing program of the State board of health and the accompanying attempt to raise standards in such homes were increasing the cost of operation. The increase in cost had been reflected in charges for care. There had been no parallel increase in the amount of public assistance grants. As a result, there was a widening gap between the charges made by nursing and boarding homes and the amount recipients of public assistance were able to pay. Lack of information led the two agencies to study the cost of care in nursing and boarding homes.

In this joint study, the two agencies did not contemplate establishing a cost of care scale to be imposed on nursing and boarding home operators or establishing the amount which they should charge for care. We hoped that information on the cost of a standard of care that assured minimum adequacy could be established for the use of agencies and interested communities as a guide to the amount of public money needed to provide adequate care for recipients of public assistance and to provide adequate compensation for operators. We felt that the cost of acceptable care for the average patient should exclude extra services which various homes may offer at extra cost. The term "cost" in this study included a fair return on investment.

At best, the services at a nursing home are difficult to evaluate inasmuch as many of the usual yardsticks of achievement or failure cannot be used to measure the intangibles. We could tabulate types of activities and physical facilities. However, the tender loving care, the

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little "extras," the quality and effectiveness of the specific nursing activities which influence the health and happiness of the residents are more difficult to appraise. Fortunately, such elements do not necessarily contribute to costs. With these limitations in mind, the summary of our findings may be helpful.

Plans for the Study

We recognized from the beginning that the study would be time consuming. Also it would be virtually impossible to make as complete a study as would be desirable because of staff limitations of both agencies. However, we thought that, through the cooperation of the two agencies at both State and local levels and with the cooperation of the operators of the homes, some valid information might be obtained.

The cost of care fell into two logical divisions, overhead expenses and services. Because of the varying needs of the person served as well as the difference in required equipment and facilities, costs in nursing homes vary decidedly from costs in boarding homes. Therefore, in the study, the average cost of acceptable care per patient in nursing homes and in boarding homes were determined separately.

In the study, for purposes of clarification and administration, nursing homes were defined as homes for the care of patients not requiring hospitalization. Many of the patients or residents of these homes have a chronic disease or are medical or surgical patients requiring further institutional care after hospital discharge.

Boarding homes for the aged were defined as being essentially for domiciliary and custodial care for aged persons, some of whom may require medical and nursing supervision.

The per patient cost of ordinary services, distinct from nursing care and housekeeping services, was determined and added to the average overhead charges.

In order to obtain cost figures for services, the nursing home operator was asked for data or the types of nursing and housekeeping services, the amount of time consumed in giving a particular service, and the number of times a specific service was performed.

Two schedules were developed for gathering this information. Both contained questions on nursing and housekeeping functions. Schedule A was devoted primarily to questions on nursing functions with a few housekeeping items. Schedule B was primarily filled with housekeeping items, but a few questions on nursing functions were included. The forms were devised in this manner because, in many instances, the size of a home and the number of the staff determined the types of services given by the workers in that particular home. Also, in some homes the nurses were doing the work ordinarily performed by maids, and the untrained workers were giving the nursing service. Because of this overlapping of services, each worker was asked to fill out both "A" and "B" for each of the 14 workdays of the study.

The time spent on services as reported by the homes on the schedules was compared with current State nursing home standards and with hospital standards. Although nursing homes could not be expected to provide services equal to hospital standards, such a comparison was useful in evaluating the difference in the quality of care. The same comparison was applied to boarding homes.

The average wage for nursing service was computed from the average wage for registered nurses, licensed practical nurses, aides, and orderlies throughout the State of Florida. The frequency with which licensed practical nurses, aides, and orderlies were hired to provide nursing service in ratio to the number of registered nurses hired to provide this service was established from personnel information obtained from the homes. The wages paid to the three classifications of employees was then averaged in the same ratio, and the hourly figure thus arrived at was accepted as the average hourly wage paid for nursing service. After the average wage and time figures were obtained, the number of hours of service provided was multiplied by the hourly wage to arrive at the average cost of service in a home.

To obtain figures on overhead costs, a schedule was prepared for entering detailed information on expenditures by the operator for capital outlay and fixed and semifixed charges of operation. This schedule C requested identifying information, the average number of patients, and minimum and maximum rates

charged. In addition, it asked for information on the property occupied; the number and types of buildings; the age of the buildings; if owned, the value, amount of mortgage and mortgage payments, taxes, insurance, maintenance, and depreciation; if rented, the monthly rent. This schedule also asked for costs of licenses, liability insurance, utilities, medicine and medical supplies, transportation, laundry, cleaning supplies, and telephone service. Information on the cost of replacement of furnishings and the expenditure for personnel was also requested. Although the cost of nursing personnel was specifically eliminated as an operating cost since the per patient cost of service was determined and included elsewhere, questions on all personnel were included on schedule C to obtain information on the average wage paid to nursing personnel. Wages paid to cooks, maids, maintenance men, and others, with the exception of nursing personnel, were considered as personnel costs in operating the home.

A simple form C supplement was also devised to help nursing home operators to keep a record of daily expenditures. Use of this form was not mandatory but was available to operators who did not use regular accounting systems. This part of the study was conducted during three winter months in order to include the cost of fuel, since, in most sections of the State, heat is not required during other months.

On the advice of two investment experts, 12 percent of total investment in real estate and 20 percent of investment in equipment were accepted as the annual cost for shelter and equipment, respectively.

Recognizing that financing costs of real property and equipment as well as maintenance costs of the home might remain fairly static, and that the cost of shelter, licenses, insurance, telephone service, and utilities were fixed charges which would change very little regardless of the number of beds occupied, the per capita cost of these items was derived by dividing the totals by the bed capacity of the home. Food, laundry, medical supplies, and transportation of patients were semifixed charges which would vary according to the number of beds occupied, and the per capita cost was derived by dividing those totals by the average number of patients receiving care during the period of the study.

In addition to capital outlay cost and fixed and semifixed charges, the total included an item for wages for the owner-operator. The amount was determined by the proportion of time spent on various duties as administrator, nurse, chauffeur, and so on. If the operator had responsibility for the home and also served as one of the nursing personnel, compensation for the time spent on administration was included but nothing for nursing service as that service was recognized elsewhere. If the operator gave full time to administrative and supervisory responsibilities and his services were not recognized elsewhere, an amount was entered to compensate him for full-time employment. If the owner were not the operator but merely had a financial investment in the enterprise, no salary was entered for him.

Originally, all homes licensed by the State board of health were to be asked to participate. At the time the licensing program was initiated, the State board of health had issued licenses to all homes which applied without regard to current standards. In the 1½ years after the licensing program had begun, there had been a concerted effort on the part of the State board of health staff to help the temporarily licensed homes to meet the standards. When the study was planned, many licensed homes had not met all requirements but in the majority there had been at least a degree of improvement and most homes were providing adequate care. We hoped that a large majority would participate in the study and that, in any event, there would be representation of all types of homes: large and small; nonwhite and white; urban, semiurban, and rural; expensive and inexpensive.

Since the study was a joint venture, the local staffs of both the county health units and of the Florida State Department of Public Welfare were asked to meet with the operators to explain the aims of the study, the use of the schedules, and the procedures, and to help them to develop the data.

Because of the nature of their respective fields, the local health department staff was asked to work with the operators on service costs, and the local welfare department staff was asked to work with the operators in determining the cost of operating the home. When

the study was ended, completed schedules were collected and compilations made by State offices.

Procedures Followed

At the time of the study there were 274 licensed homes. A letter from the State board of health was sent to the operators of these homes explaining the plans for the study and asking if they wished to participate. Exactly one-half of the licensed homes, or 137, replied in the affirmative.

Of the 137 homes signifying their willingness to participate, a number did not follow through because of the operators' unwillingness to do the necessary clerical work; a few were excluded because the limitation of time prevented the necessary personal interview with operators. More homes were omitted because a county health department did not have the necessary personnel to participate and support the program. A few were dropped because the operator and her personnel found it impossible to grasp the significance of the information desired for the survey.

In the final group of homes included in the study, the number of nursing homes and boarding homes were in almost identical relationship to the number of licensed homes in the State, and every type of home originally planned for was included.

Following the prearranged program, a public health nurse and a welfare visitor went together on an initial visit into each home to discuss the study and to plan with the operator for completing schedules. During their subsequent visits, the nurse each week and the welfare worker each month, discussed and answered questions about the schedules, and, finally, collected the completed schedules.

Nursing Home Service Costs

An average of 2.3 hours of daily nursing service per patient was reported on the schedules from nursing homes. This ranged from 3.2 hours of nursing care in the better-equipped homes to a minimum of 1.2 hours of nursing care per patient in the less well-equipped homes.

Information obtained from the hospitals throughout the State indicated that 3.4 hours of daily nursing care was the average standard in private and public hospitals.

The personnel required by the Florida State Board of Health standards for nursing homes would provide 2.8 hours per day for each patient, if followed.

To reconcile the discrepancy in these three standards, we consulted with members of the nursing profession and staff members of several hospitals. The consultants agreed that the hours of nursing service as reported by the homes was substandard and that a minimum of 2.6 hours per day of nursing service must be provided for acceptable care.

The average wage paid for registered nurses in Florida was found to be $240 per month; for licensed practical nurses, $155; and for aides, orderlies, and attendants, $125 per month. When these wages were averaged together in the same ratio as personnel were employed to provide nursing service, the wage paid for nursing service averaged $0.85 per hour.

Multiplying this figure by the 2.3 hours of nursing service reported by the homes, the per patient cost of nursing service averaged $58.65 per month.

The compromise figure of 2.6 hours of nursing service with the same hourly wage, established the cost of adequate nursing service at a minimum level of $66.30 per month.

Using the 2.8 hours included in the State board of health standards for nursing homes, the $0.85 hourly wage established the cost of service at $71.40 a month.

The amount of nursing care provided in a hospital could be accepted as the care required for the acutely ill. The 3.4 hours of nursing service (hospital standards) at the $0.85 hourly cost of service established the minimum cost of service for acutely ill persons at $86.70 a month.

Boarding Home Service Costs

In the boarding homes, an average of 1.07 hours of nursing service per day was given to each patient. This was slightly lower than the Florida State Board of Health standards which require that personnel in boarding homes provide 1.4 hours of care. The consultants

agreed that no standard providing for less care was adequate.

In determining the average wage of persons providing care in boarding homes, only the wages paid to licensed practical nurses and aides and orderlies were considered; their average wage, in the ratio of the numbers employed in boarding homes, was $0.75 an hour.

At the hourly wage of $0.75, the 1.07 hours of service in the homes reporting established the cost of service at $24 per patient per month. The $0.75 hourly wage with the State board of health standard of 1.4 hours of service per day established the cost of adequate service to the patient in a boarding home as $31.50 per month.

Operating Costs

The original plan was to obtain completed schedules on operating costs for three consecutive months. When the completed schedules were evaluated, we found that some homes submitted figures for only 1 month, but indicated that the figures were average. These schedules were included. In some cases, 2 months' reports were received. In the majority of the homes, the 3 months' reports were averaged together to arrive at the average monthly cost for items included.

The only figure reported comparable with an acceptable standard was the figure for cost of food. Information from the nutrition staff of the State board of health established the per patient cost of food in the average nursing home at $25.50 per month. The average amount spent for food was reported by the nursing homes as $24.50, and by boarding homes as $24.15.

Generally, a wage for the operator was not reported except when the operator did not act as one of the nursing personnel. From operators' wages reported and the comparative amount of time the operator spent on administrative duties, we determined that $15 a month should be included as a per patient wage for the operator who spent full time on his duties as administrator. A $5 per patient monthly cost was included for wages to the operator who acted in dual capacity as operator and nurse. There were no boarding homes where the operator did not also give service; in those homes the $5 per patient figure was included as the salary for the operator.

Findings

The final compilation on a per patient monthly figure for capital outlay and fixed and semifixed charges of operating nursing homes was $89. Included in this total was the wage paid to the owner-operator.

The overhead plus the monthly cost of 2.3 hours of patient daily nursing service as reported by the homes, $58.50, equalled $147.50, the average per patient cost of care in the nursing homes.

Adding the overhead to the monthly charge for 2.6 hours of nursing service, $66.30, the compromise standard, established $155.30 as the cost of adequate service in a nursing home.

These figures refer to the average patient. Acutely ill or extremely disturbed patients require additional nursing service. We felt that 3.4 hours of nursing service should be the minimum in such circumstances; thus the cost of care for acutely ill persons was established as $176 a month.

Overhead in boarding homes, compiled by the same method as for nursing homes, was $75.50. Adding this to the cost of 1.07 hours of care, $24, resulted in $99.50 as the reported cost of residence in boarding homes.

Using the same overhead figure of $75.50 and substituting $31.50 as the cost of the 1.4 hours of care required by State board of health standards established the cost of care in a boarding home with adequate custodial supervision at $107 per patient.

The figures for nursing and boarding home care should be adjusted upward to insure adequate amounts being spent for food, in line with information that adequate food cannot be purchased for less than $25.50 per patient.

The cost of care in the larger boarding and nursing homes was somewhat smaller than cost of care in the same type of home providing for fewer patients. In the nursing homes with a capacity of 10 or more patients, the average cost was $140. In nursing homes providing care for fewer than 10 patients, the average cost was $167. A similar but less marked

difference was obtained in figures from boarding homes. In those boarding homes caring for 10 or more patients, the cost totaled $95. In boarding homes caring for fewer than 10 patients, the cost was $104.50. Charges made by the nursing homes ranged from $60 a month (the amount which can be paid from public assistance grants) to a maximum of $400. Charges made in boarding homes ranged from $40 to $239 a month.

Conclusions

Under the present Florida State Board of Health standards, 2.8 hours of nursing care are recommended for nursing homes. If the compromise figure of 2.6 hours of nursing care per person per day is accepted as the minimum amount of care needed to provide basic, essential nursing service, then the nursing homes which give an average of only 2.3 hours of nursing care fall below an acceptable standard. If the homes participating in the study are representative of all the nursing homes in the State, 77 percent of the homes provide a substandard amount of nursing service, and 23 percent provide adequate or above standard care. In the boarding homes, 69 percent fail to meet acceptable standards, and 31 percent meet or exceed the standards established by the State board of health as sufficient to provide adequate custodial care.

The total responsibility for the quality or quantity of care cannot be placed on the nursing home operators. Nursing home operators face many difficulties in the operation of these homes. Scarcely an operator in the State has not experienced difficulty at some time or other in obtaining qualified help. The lack of trained help is shown in the study. A large number of untrained employees provide different types of care to patients. Many nurses do not wish to work in homes giving care to the aged and chronically ill. Hospitals that can offer adequate salaries and satisfying working conditions appear to be absorbing desired trained personnel.

The many nursing activities in nursing homes provided largely by aides and other untrained help are reflected in the quality as well as the quantity of nursing care. Many capable women, despite their lack of preparation, are doing a worthy job. Lack of finances is one of the major reasons they are not prepared. There are 18 schools for the preparation of the professional nurse and 12 schools for the preparation of the licensed practical nurse in Florida. A plan for financial assistance for trainees would enable more women to take advantage of these facilities and would increase the number of available trained nursing personnel.

The financing of a nursing home requires initial investment and a continuing expenditure of time and money by the operator. To meet these financial demands and to insure a reasonable return on the investment, the operator must charge and receive a reasonable amount in payment for services. The figures from this study reflect a cost far above the sum currently provided by most State or local welfare funds for indigent patients.

Most of the homes adjust charges for the care of private patients who demand and are able to meet the cost of extra services. This is to be expected.

The figures established by the study, however, do not include the costs of these additional services. The cost of $156 for nursing care and $108 for boarding care reflects a standard of care which provides for only those services which are basic. To provide for any less results in suffering by the patient who must be cared for under substandard conditions.

Figures were not obtained on the proportionate number of patients who receive public welfare grants and the number of private patients in the homes. Many operators stated that they refuse to take patients for $60 a month. In general, those same homes are the homes where standards are as high or higher than the standards required by the State board of health.

Apparently, this gap between the actual cost of care and the amounts which the recipients of public assistance can pay is a contributing factor in the low standards maintained in many homes.

It was not possible during the short period of the study to secure data on medical care provided in the homes, the number of patients now attending a clinic or those being seen regularly by a doctor. There has not been a systematic referral system developed between the homes

and the hospitals which provide clinic care to the patients. How much the establishment of such a referral system would reflect in additional and more adequate nursing care being required for patients is not known.

In addition to the cost of basic care in a nursing or boarding home and the problem of providing adequate medical supervision, there is a vital need for recreation and rehabilitation services for the aged and chronically ill. Only a few homes provide a program of recreation or rehabilitation.

It is obvious from the findings of this study that additional help must be given in raising the standards of physical care and in providing additional services for patients who must be cared for in an institutional setting. It is equally obvious that with present payments for care and current limitations of available personnel it is not possible to appreciably raise standards.

An Important Date

Each month your health department and many hospitals, laboratories, schools, clinics, and homes receive a copy of PUBLIC HEALTH REPORTS, mailed to arrive on the 20th, or even earlier, depending upon geographic location of the subscriber.

Its pages carry timely research reports, analyses of current trends, new methods, concepts, and ideas, and topical reviews for the busy scientist, teacher, or public health worker. Capsule coverage of important public health meetings, like those of the American Public Health Association, help the PHR reader.

You can have your personal copy promptly. Use the subscription blank on the inside back cover. Let the 20th of each month be an important date for you, too.

Scheduled for early publication

Abstracts—First Carville Leprosy Conference

Legislation on Air Pollution

Group Therapy For Delinquent Boys

Study of an Infectious Hepatitis Outbreck

National Tuberculosis Association Highlights

Rehcbilitating Handicapped Children in Queens

Heart Disease at Mid-Century

By PAUL D. WHITE, M.D.

IN THIS YEAR, still in the middle of the twentieth century, our hearts control much of our destiny. Diseases of the heart and arteries are responsible for a very large percentage of the illnesses and deaths in this country, even among children and young and middle-aged adults.

Despite the slowness with which we are moving in our efforts to meet this challenge, really great progress has been accomplished in several directions:

Cardiovascular syphilis has been almost wiped out as a result of the remarkably successful campaign for the prevention and early recognition and treatment of syphilis itself and the introduction of the antibiotics, especially penicillin. Once cardiovascular syphilis made up nearly 25 percent of all cases of heart disease; now it is well under 1 percent.

Rheumatic heart disease, at one time the most common type of all, is on the wane. In New England 30 years ago, it led all the other kinds of heart disease in prevalence. Now it is a poor third. This reduction is associated with several factors, notably (*a*) the improvement in living conditions and (*b*) preventive measures to control infection by the hemolytic streptococcus, largely responsible for this type of heart disease.

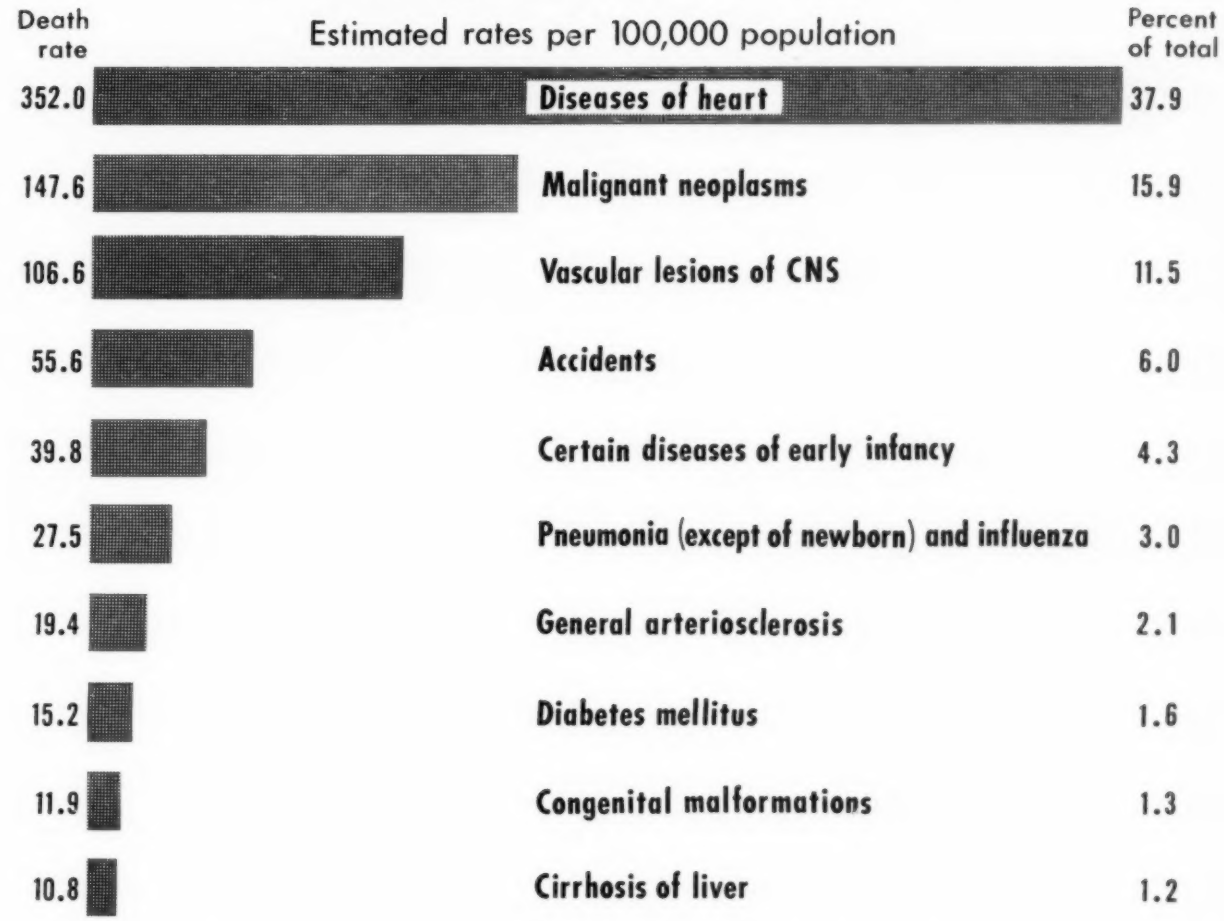
Another advance of importance, achieved through remarkable development in surgery and splendid teamwork between physician and surgeon, is the rescue of a great many patients, thousands and thousands, afflicted with severe mitral stenosis. It is to be hoped that, with the reduction of rheumatic heart disease, much less need will exist in the future for this magnificent surgery of today.

Subacute bacterial endocarditis, formerly called malignant because it killed almost 99 percent of all patients, is now not only curable in about 75 to 80 percent, but can probably be prevented in many patients by the use of antibiotics. Moreover, as we reduce the incidence of rheumatic and congenital heart disease, subacute bacterial endocarditis will decline.

Other infections responsible for serious heart diseases in the past also are becoming scarce. Included among them is diphtheria, which used to be fatal in many patients because of its effect on the heart.

Chronic constrictive pericarditis, once incurable, is clinically reversible now in more than half the patients by the use of surgical techniques developed in the past 25 years. Its fundamental cause, tuberculosis of the pericardium, should be, along with tuberculosis in general, steadily on the road to oblivion so that in another generation there should be little or no demand for such surgery.

Dr. White is emeritus clinical professor of medicine, Harvard University Medical School. He is also executive director of the National Advisory Heart Council and president of the International Society of Cardiology. *The accompanying comments were presented at the American Heart Association's dinner for opening the National 1956 Heart Fund Campaign, January 31, in Chicago.*



Source: National Office of Vital Statistics, Public Health Service, Monthly Vital Statistics Report, vol. 4, No. 13, May 28, 1956

Thyrotoxicosis used to be the cause of heart disease in an occasional patient. Now, as a result of early recognition and much more satisfactory treatment of thyrotoxicosis, heart disease from this cause is rare.

Cor pulmonale, both acute and chronic, is on the wane as a result of the lower incidence of pulmonary embolism and the control of dusty air, indoors and out. How much harm smog may be doing is not known.

Even one of the more prevalent and serious kinds of heart disease, hypertensive heart disease, is now beginning to yield to treatment. The vigorous attack made on hypertension in the last two decades through surgery, diet, and the use of drugs has been extremely helpful.

Problems for the Future

We haven't done much about the most important heart disease of all, namely, coronary heart disease, except that we can recognize it more readily than we used to, we know a little more about its course, and we can treat it more intelligently.

Congenital heart disease also remains as a great problem for the future. We have learned little about it, and we cannot prevent it. We know that it can be caused by german measles in the mother during the first 3 months of pregnancy, but there are certainly other factors and causes not yet discovered. The one bright spot with respect to congenital defects is that a number of them can be corrected, in whole or in

part, by surgery. This in itself is, of course, no small achievement.

Thus, progress against heart disease is still far from its goal: prevention of new cases and adequate treatment of heart disease where it exists. The major cardiac problems are congenital defects, high blood pressure, and coronary heart disease. I think, too, we must take cognizance of the problem of apoplexy, or to use the longer term, cerebral vascular disease, which afflicts so many people with or even without high blood pressure. Also, there is much to be done about the prevention of disease of the larger arteries, the aorta and the blood vessels of the legs in particular. Arteriosclerotic disease of the kidney is still another problem that needs much further study for the sake of prevention, recognition, and treatment. We have found that it tends to be one of the great hazards of old age. Perhaps with its control, healthy old age can be prolonged.

The need for applying, to the best of our ability, the knowledge we already have, in private practice and in community programs, deserves special attention. For example, it is known that the great majority of cardiac patients not only can work but should work. Physical exercise and mental activity are two of the best therapeutic measures for patients with heart disease. Like persons who are crippled in other parts of their bodies, cardiac patients perform some of the best work in the world.

In the study of heart disease, the epidemiological approach offers opportunities not otherwise available. This approach needs to be used more extensively, not only in our own country but world wide. The study of the prevalence of the various kinds of heart disease in different groups and communities here and in foreign lands can be valuable both for the people of other countries and for those in this country. International teams should cooperate in the study of heart disease so that the situations in one country can be compared with those in another.

Heart programs are among the most important health campaigns ever planned. Though we may be not one-third of the way toward the maximum achievement, the years ahead are filled with promise. We can protect the hearts of the young and the middle-aged with something much more substantial than the casual advice to "take it easy," even if that is good advice, which it may not always be. If we pursue these programs with vigor, 10 years from now, I venture, we shall have remarkedly reduced heart disease in the young and middle-aged throughout the world.

Staff College Course for Nurses

The fourth Federal Civil Defense Administration Staff College course for nurses is scheduled to be given at the FCDA National Headquarters, Battle Creek, Mich., September 24–28, 1956.

Special emphasis will be given to educational and training programs for nurses in civil defense.

Priority for enrollment will be given to nurses associated with schools of nursing, inservice training programs of hospitals, industry, schools, public health agencies, nursing organizations, and State or local civil defense offices. There is no tuition fee.

Nurses may obtain application forms from their local or State civil defense office, or by writing to the Staff College, National Headquarters, Federal Civil Defense Administration, Battle Creek, Mich.

8-month Bacteriological and Serologic Study

Group A Beta Hemolytic Streptococcus and Rheumatic Fever in Miami, Fla.

By MURRAY M. STREITFELD, Ph.D., MILTON S. SASLAW, M.D., and SIMON D. DOFF, M.D.

A LONG-TERM STUDY of the relationship of group A beta hemolytic streptococcus to rheumatic fever in Miami, Fla., was undertaken to explain why rheumatic fever seems less severe and occurs less frequently in Miami than reported elsewhere (*1–3*). A survey of the prevalence, type, and virulence of this group of organisms and the immunological response of the host over a period of years, we felt, would yield a pattern of host-organism relationship which might enable us to answer this question.

Our preliminary observations from February through May 1953 revealed the presence of group A beta hemolytic streptococcus in the throats of 16.3 percent of 343 school children in Miami (*4*) at some time during the 4-month period. This suggested that factors other than the mere presence of this group of organisms are responsible for the apparent difference in rheumatic fever in Miami's "tropical" climate (*5, 6*), as compared with other more northerly geographic localities.

Since the preliminary findings were limited to a 4-month study period, we continued to culture samples from the throats of these children for group A beta hemolytic streptococcus from October 1953 through May 1954 in order to obtain a more comprehensive picture of the prevalence of this group of bacteria in the Miami area. In addition, antistreptolysin O studies were performed to determine whether the strains of group A beta hemolytic streptococcus isolated evoked a systemic response. This is a report of the bacteriological and immunological data obtained during this 8-month period and a discussion of the significance of the results.

Material and Methods

Throat Culture Studies

During the 8-month period, October 1953 through May 1954, pairs of throat swabs were taken monthly from an average of 351 children attending grades 1 and 2 in three schools in Miami, for a total of 2,809 pairs of swabs. In all, 417 children were included in the study, and each child's throat was swabbed an average of 6.7 times.

The children came from grades 1 and 2 in the same three schools previously studied (*4*); these represented a low-income white group, a middle-income white population, and a mixed-income Negro group. The sample selected, though not truly random, represents the stable

Dr. Streitfeld is bacteriologist and Dr. Saslaw is director of medical research at the National Children's Cardiac Hospital, Miami, Fla. Dr. Doff is director of the division of heart disease control of the Florida State Board of Health, Jacksonville, Fla.

This study was supported in part by funds from the Florida State Board of Health and grant H–1738, Public Health Service. Providing technical assistance at the National Children's Cardiac Hospital were Alba Colon, Nettie E. Cudequest, and Ruth Rosen.

school population. A high-income group was omitted because such a group does not maintain year-round residence in Miami and therefore does not permit long-term observation. The first graders were new to the study. Only 189 second graders who had participated the year before, as first-grade students, were included. Written permission of the parents had been obtained for each child.

In all, 1,050 children were registered in grades 1 and 2 of the three schools. Thus, the 417 children in the study represented 39.7 percent of the total registration in these two grades.

As in the preliminary study (*4*), throat swabs were taken in duplicate from all children present in school during the mornings set aside for this phase of the work. The same technician performed all the swabbings within a 2-hour period. All the collected swabs were taken promptly to the laboratory for immediate plating. One swab was streaked on a plate of Difco blood agar base (DBAB) and the other on a plate of Difco neopeptone heart infusion agar (DNHI); both media were enriched with 4 percent defibrinated sheep's blood. DNHI had been used in May 1953 as an adjunct to DBAB to insure recovery of the highest number of positive isolates. Incubation, isolation, and subculturing of the cultures were carried out as previously. Grouping and typing were performed again under the supervision of Dr. Elaine Updyke at the Streptococcus Laboratory, Communicable Disease Center, Public Health Service.

No attempt was made to obtain cultures from the throats of children absent on the days set for study. However, the school nurses checked the reason for absence in most instances.

Antistreptolysin O Studies

Blood samples were taken simultaneously with throat swabs every 2 months. The serums were kept in deep freeze until the end of the study, when antistreptolysin O titer determinations were made using a single lot of commercial Difco Bacto streptolysin O reagent. In all, 996 serums from 356 children were tested by standard procedure (*7*) at titers of <12, 12, 50, 100, 125, 166, 250, 333, 500, 625, and 833.

The bacteriological findings were classified into four categories as follows:

1. Serums from children whose throats yielded no beta hemolytic streptococcus or group B beta hemolytic streptococcus only. The latter group was included in this category because it does not produce streptolysin O (*8*).
2. Serums from those with nontypable strains of group A beta hemolytic streptococcus, either alone or in combination with other groups of beta hemolytic streptococcus.
3. Serums from children bearing typable strains of group A beta hemolytic streptococcus found at least once, either alone or in combination with other groups of beta hemolytic streptococcus.
4. Serums from children from whom group C or group G beta hemolytic streptococcus, or both, were recovered. Some strains of these groups produce streptolysin O (*8*).

In order to correlate and evaluate our bacteriological and serologic findings, an antistreptolysin O index (*9*) was established for each bacteriological category. The antistreptolysin O titers were assigned numerical rank from 1 to 11, respectively. The index was calculated according to the following formula:

Where R=numerical rank and S=number of samples for the particular rank:

$$\text{Antistreptolysin O index} = \frac{(R_1 \times S_1) + (R_2 \times S_2) + \ldots (R_{11} \times S_{11})}{\text{Total samples per category}}$$

Average peak titers were calculated for each of the four bacteriological categories and for the total number of children studied. The peak titer for each child was the highest antistreptolysin O level obtained during the study.

The antistreptolysin O index has the advantage of overcoming excessive weighting caused by small numbers of samples at high titer levels. Average antistreptolysin O titers are included for comparative purposes because average computations of titers are in common usage.

Results

Throat Culture Studies

The groups and types of beta hemolytic streptococcus isolated from the throats of the children studied from October 1953 through May 1954, together with a summary of the findings for February through May 1953 (*4*), are shown

in tables 1, 2, and 3. The highest percentage of positive cultures (15.4 percent) was obtained in May 1954 (table 1), the lowest (6.2 percent) in December 1953. The average percentage of positive cultures was 11.4 percent for the 8-month period and 6.2 percent for the 4-month period. The earlier 4-month study, of course, is not comparable quantitatively to the later 8-month survey.

Group A organisms were found at least once in 126 children, or 35.9 percent of the average of 351 children studied in the 8-month period (table 2). This percentage was about the same for each of the three schools (table 3), and no significant differences were found in the number of isolates from first grade children compared with second graders. The average monthly recovery rate of group A beta hemolytic streptococcus was 8.0 percent.

Nine types of group A beta hemolytic streptococcus (table 4) were encountered in October 1953 through May 1954, in contrast to strains of type 12 only (with the exception of a single strain of type 28) in February through May

Table 1. Grouping of beta hemolytic streptococcus isolated from 2,809 throat cultures in 417 children over an 8-month period, October 1953–May 1954, and comparison with February–May 1953, Miami, Fla.

Month	Number of children		Number of children positive 1st time					
	Absent	Present and cultured	Group A	Other groups				Total
				B	C	F	G	
Oct. 1953	35	382	24	4	2	----	4	34
Nov. 1953	45	372	25	2	4	2	2	35
Dec. 1953	46	371	4	2	----	----	1	7
Jan. 1954	55	362	12	2	----	----	2	16
Feb. 1954	78	339	17	2	3	----	2	24
Mar. 1954	93	324	8	----	2	----	1	11
Apr. 1954	89	328	15	1	3	----	2	21
May 1954	86	331	7	----	7	----	2	16
Total, Oct. 1953–May 1954	--------	2, 809	112	13	21	2	16	164
Summary Feb.–May 1953	--------	1, 154	46	6	4	[1] 1	1	58

Month	Number of cultures positive 2d, 3d, 4th, etc., times								Total positive cultures	
	Group A			Other groups					Total	Number	Percent
	1st time	New type	Same type	B	C	F	G	NG[1]			
Oct. 1953	------	------	------	------	------	------	------	------	------	34	8. 9
Nov. 1953	1	------	7	1	----	----	----	1	10	45	12. 1
Dec. 1953	1	------	9	3	----	----	3	------	16	23	6. 2
Jan. 1954	------	------	13	2	2	----	1	------	18	34	9. 4
Feb. 1954	3	3	13	2	2	----	2	------	25	49	14. 5
Mar. 1954	2	2	12	2	3	----	4	------	25	36	11. 1
Apr. 1954	3	2	14	4	4	1	----	------	28	49	14. 9
May 1954	4	------	24	1	5	----	1	------	35	51	15. 4
Total, Oct. 1953–May 1954	14	7	92	15	16	1	11	1	157	321	11. 4
Summary Feb.–May 1953	1	1	11	----	----	----	----	1	14	72	6. 2

[1] Nongroupable.

Table 2. Group A beta hemolytic streptococcus isolated from 2,809 throat cultures in 417 children over an 8-month period, October 1953–May 1954, Miami, Fla.

Month	Number of children cultured	Number of children with group A for the first time						
		Ao	At	At+Ao	Change to group A		Total	
					Ao	At	Number	Percent
Oct. 1953	382	22	2				24	6.3
Nov. 1953	372	16	9			1	26	7.0
Dec. 1953	371	2	2		1		5	1.3
Jan. 1954	362	9	2	1			12	3.3
Feb. 1954	339	13	3	1	2	1	20	5.9
Mar. 1954	324	5	3		1	1	10	3.1
Apr. 1954	328	6	9		1	2	18	5.5
May 1954	331	5	2		2	2	11	3.3
Total	2,809	78	[1] 32	[1] 2	7	[1] 7	126	35.9
Average per month	351.1							4.5

Month	Group A type changes		Total new group A isolates		Number of cultures positive 2d, 3d, 4th, etc., times				Total positive group A cultures	
	Ao	At	Number	Percent	Ao	At	Total		Number	Percent
							Number	Percent		
Oct. 1953			24	6.3					24	6.3
Nov. 1953			26	7.0	6	1	7	1.9	33	8.9
Dec. 1953			5	1.3	6	3	9	2.4	14	3.8
Jan. 1954			12	3.3	8	5	13	3.6	25	6.9
Feb. 1954	1	2	23	6.8	9	4	13	3.8	36	10.6
Mar. 1954	1	1	12	3.7	9	3	12	3.7	24	7.4
Apr. 1954	1	1	20	6.1	12	2	14	4.3	34	10.4
May 1954			11	3.3	15	9	24	7.2	35	10.6
Total	3	[1] 4	133	38.0	65	27	92	26.2	225	64.0
Average per month				4.7				3.3		8.0

Ao=nontypable group A beta hemolytic streptococcus; At=typable group A beta hemolytic streptococcus.
[1] The 45 typable cases in these 4 columns are listed as total new isolates in table 4.

1953. Although type 12 predominated during the 8-month study and occurred in 26 instances, types 1 and 4 also were found frequently, type 1 in 17 and type 4 in 13 cases.

In 60 children, group A organisms were recovered 2 to 7 times during the 8-month period (table 5). Both typable and nontypable organisms were isolated from 8 children. In 8 other children, a strain of group B, C, F, or G beta hemolytic streptococcus was isolated, as well as a typable or nontypable strain of group A.

Of the 58 children who had beta hemolytic streptococci in their throats during the pilot study, only 29 could be included in the 8-month study. Of these 29 children, 21 (72 percent) continued to show the presence of beta hemolytic streptococci in their throats; 14 (48 percent) maintained the same type or group of organism; 5 had a different organism, and 2 had two different organisms. Eight were negative for beta hemolytic streptococcus. Fourteen of the twenty-four children with group A streptococcus in the first year continued to carry the same group of organisms in the second year.

A comparison of the number of positive cul-

tures isolated on each of the two media used during the 8 months of the study showed that had a single culture plate been used we would have failed to recover approximately one-third of the total beta hemolytic streptococci and one-third of the group A organisms isolated. Both media were found to be equally effective in the isolation of beta hemolytic streptococci and of group A organisms. Present studies are being conducted to determine the effect of streaking the initial swabs on three plates.

Numbers of colonies of beta hemolytic streptococcus present on initial plates were recorded. Approximately one-fifth of all children with group A organisms recovered from their throats yielded more than 10 colonies on at least one of the 2 initial plates; four-fifths had under 10 colonies.

Some strains that showed alpha hemolysis on initial surface plating were found to give beta hemolysis on subsurface culturing. The failure of these strains to produce streptolysin S probably explains the absence of surface beta hemolysis, which depends on the formation of this lysin. On the other hand, subsurface beta hemolysis, the criterion for classifying a beta hemolytic streptococcus, is due to the formation of the oxygen-labile streptolysin O (*10*).

Table 6 lists children from whom the different groups of beta hemolytic streptococcus were isolated, according to the number of throat specimens cultured for each child. Higher

Table 3. School distribution of group A beta hemolytic streptococcus, October 1953–May 1954, Miami, Fla.

School	Average number of children studied	Children with group A		Total number of cultures taken	Total group A isolates	
		Number	Percent		Number	Percent
K	148. 4	54	36. 4	1, 187	98	8. 3
C	77. 3	25	32. 3	618	50	8. 1
D	125. 5	47	37. 5	1, 004	77	7. 7
Total	351. 1	[1] 126	[1] 35. 9	2, 809	225	8. 0

[1] In 7 of these children, changes in types or typability occurred, making a total of 133 different strains of group A beta hemolytic streptococcus isolated (37.9 percent).

Table 4. Types of group A beta hemolytic streptococcus isolated from 2,809 throat cultures in 417 children over an 8-month period, October 1953–May 1954, and comparison with February–May 1953, Miami, Fla.

Month	Typable group A new isolates (1st time)										Subsequent typable group A isolates					
	1	3	4	12	23	28	31	33	44	Total	1	3	4	12	28	Total
Oct. 1953				2						2						
Nov. 1953		1	2	2	1	3		1		10				1		1
Dec. 1953				2						2		1		2		3
Jan. 1954				[1] 3						3		1	1	2	1	5
Feb. 1954			3	3				[1] 1		7		1	1	1	1	4
Mar. 1954			2	1			1		1	5		1		2		3
Apr. 1954	8		3				1			12				2		2
May 1954	3			1						4	6		1	2		9
Total	11	1	10	14	1	3	2	2	1	[2] 45	6	4	3	12	2	27
Summary Feb.–May 1953				25		1				26				1		1

[1] Includes 1 case of double infection with nontypable group A as second organism.
[2] Includes from table 2: At; At + Ao; At (change to group A); and At (type change).

Table 5. Sixty children with repeatedly positive throat cultures, October 1953–May 1954, Miami, Fla.

Case No.	1953			1954				
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
1003	Neg.	Neg.	Neg.	Neg.	Ao	Neg.	Neg.	Ao
1006	Abs.	Neg.	Neg.	Neg.	Abs.	Abs.	Ao	Ao
1007	Neg.	Neg.	Neg.	Neg.	A33+Ao	Ao	Ao	Ao
1009	Neg.	Neg.	Neg.	Neg.	A12	Abs.	A12	A12
1024	Neg.	Neg.	A12	Neg.	A12	Neg.	Neg.	Neg.
1027	A12	A12	Neg.	A12	A12	A12	A12	A12
1033	Ao	Neg.	Neg.	Neg.	Neg.	Neg.	Ao	C
1055	Neg.	A12	A12	Neg.	Ao	Ao	Ao	Neg.
1063	Abs.	Neg.	Neg.	Neg.	Neg.	Neg.	A1	A1
1064	Neg.	Neg.	Neg.	Neg.	A4	Neg.	Neg.	A4
1106	Neg.	Ao	Neg.	Neg.	Ao	Trans.		
1113	Ao	Ao	Ao	Neg.	A12	A12	A1	A1
1116	Neg.	Neg.	Neg.	Neg.	C	Neg.	A1	A1
1117	Neg.	Ao	Neg.	Ao	[1]	[1]	[1]	[1]
1124	C	Neg.	Neg.	Neg.	Ao	Neg.	Neg.	Ao
1126	Neg.	Ao	Neg.	Ao	Neg.	Trans.		
1133	Neg.	Neg.	Neg.	Neg.	Neg.	Abs.	A1	A1
1135	Ao	Ao	Neg.	Ao	Ao	Neg.	Neg.	Ao
1140	Neg.	Neg.	Ao	Ao	Ao	Neg.	Neg.	Neg.
1144	Neg.	Ao	Neg.	Ao	Neg.	Neg.	Neg.	Neg.
1151	Neg.	Abs.	Abs.	Ao	A4	Neg.	Neg.	Neg.
1169	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	A1	A1
1173	Neg.	Neg.	Neg.	Neg.	Neg.	Abs.	A1	A1
1183	Neg.	Neg.	Neg.	Neg.	Ao	Neg.	A44	Neg.
1309	Neg.	Neg.	Neg.	A12	Neg.	Neg.	Ao	Ao
1314	Neg.	Neg.	Ao	Neg.	Ao	Neg.	Neg.	Neg.
1315	Neg.	A12	A12	Neg.	[1]	[1]	[1]	[1]
1317	Neg.	F	Ao	Neg.	Neg.	Neg.	Neg.	Ao
1320	Ao	Neg.	Neg.	Ao	Ao	Neg.	Neg.	Ao
1334	Neg.	A4	Neg.	A4	Neg.	Neg.	Neg.	Neg.
1344	Neg.	Neg.	Neg.	Neg.	Neg.	Ao	Ao	Neg.
1357	Neg.	Ao	Neg.	Neg.	Neg.	Neg.	Ao	Trans.
1360	Neg.	A28	Neg.	A28	A28	Trans.		
1368	Neg.	Ao	Ao	Neg.	Abs.	Neg.	Neg.	Neg.
1371	Neg.	Ao	Ao	Neg.	Neg.	Ao	Ao	Neg.
1373	Neg.	Neg.	Neg.	Ao	Ao	Ao	Neg.	Ao
1388	Neg.	A3	A3	A3	A3	A3	Neg.	Neg.
1389	Abs.	Neg.	Neg.	Ao	Neg.	Ao	Abs.	Neg.
1609	Ao	Ao	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
1611	Ao	Ao	Neg.	Neg.	Neg.	Abs.	Neg.	Neg.
1619	Neg.	Neg.	B	Neg.	Ao	Neg.	Ao	Neg.
1620	Neg.	Neg.	Neg.	Neg.	Ao	Ao	Ao	Neg.
1622	Neg.	Ao	Ao	Neg.	Neg.	Neg.	Neg.	Neg.
1626	Neg.	Neg.	Neg.	Neg.	Neg.	Abs.	Ao	Ao
1628	Neg.	Neg.	A12	A12	Neg.	Ao	Neg.	Neg.
1640	Ao	Neg.	Neg.	Neg.	Ao	Neg.	Neg.	Neg.
1656	Neg.	B	Neg.	Neg.	Neg.	Neg.	Ao	Ao
1660	Neg.	Ao	Ao	Neg.	Ao	Neg.	Neg.	Neg.
1673	Neg.	Abs.	Neg.	Ao	Abs.	Ao	Ao	Neg.
1675	Neg.	Neg.	Neg.	A12+Ao	Neg.	Neg.	Ao	Neg.
1684	Neg.	Neg.	Neg.	Neg.	Ao	Neg.	Ao	Neg.
1685	Neg.	Ao+G	Ao	Ao	Neg.	Neg.	Neg.	Ao
1694	Neg.	Neg.	Neg.	Neg.	Ao	Ao	Neg.	Neg.
1695	Neg.	Neg.	Neg.	Neg.	Abs.	Ao	Ao	Neg.
1702	Ao	Ao+G	Neg.	Neg.	Neg.	Neg.	C	Ao+C
1703	Neg.	Neg.	Neg.	Neg.	Ao	Neg.	Neg.	Ao
1707	Neg.	Ao	Neg.	Ao	Abs.	Neg.	Neg.	Ao
1709	Neg.	Neg.	Neg.	Neg.	Neg.	Abs.	Ao	Ao
1718	Neg.	Neg.	Neg.	Ao	Ao	Abs.	Neg.	Neg.
1742	Ao	Ao	Neg.	Abs.	Abs.	Neg.	Neg.	Neg.

[1] Withdrawn from study.

Ao=nontypable group A beta hemolytic streptococcus (ABHS); A1=type 1; A3=type 3; A4=type 4; A12=type 12; A28=type 28; A33=type 33; and A44=type 44 ABHS; B, C, F, and G each designates a beta hemolytic streptococcus group.

Neg.=negative; Abs.=absent; Trans.=transferred.

percentages of positive cultures recovered from those children from whom smaller numbers of swabbings per child were taken may reflect absenteeism due to streptococcal throat infections. However, the numbers are too small within each category to be interpreted finally.

Antistreptolysin O Studies

Table 7 shows the antistreptolysin O titers in relation to bacteriological categories, and gives the average antistreptolysin O titer and index for each bacteriological category. The antistreptolysin O index (4.6) of children with group A beta hemolytic streptococcus was elevated over the index (3.5) of children from whom no beta hemolytic streptococcus or only group B was recovered. Although children with typable strains of group A had a higher average antistreptolysin O titer than those with nontypable strains of group A, the antistreptolysin O index was the same for both. Children from whom groups C or G organisms, or both

Table 6. Relationship between number of cultures per child and frequency of recovery of various groups of beta hemolytic streptococcus

Number of months specimens were taken	Number of children cultured	Total cultures	Number of children negative	Number of children positive by number of months each child was positive							Positive cultures	
				1	2	3	4	5	6	7	Number	Percent
Group A												
8	212	1,696	143	34	20	5	5	3	0	2	138	8.1
7	89	623	57	19	10	3	----	----	----	----	48	7.7
6	37	222	26	7	4	----	----	----	----	----	15	6.8
5	26	130	16	5	3	2	----	----	----	----	17	13.1
4	16	64	12	1	3	----	----	----	----	----	7	10.9
3	12	36	12	----	----	----	----	----	----	----	0	--------
2	13	26	13	----	----	----	----	----	----	----	0	--------
1	12	12	12	----	----	----	----	----	----	----	0	--------
Total	417	2,809	291	66	40	10	5	3	0	2	225	8.0
Group B												
8	212	1,696	200	5	4	----	3	----	----	----	25	1.5
7	89	623	88	1	----	----	----	----	----	----	1	.2
6	37	222	36	1	----	----	----	----	----	----	1	2.7
3	12	36	11	1	----	----	----	----	----	----	1	8.3
Total	417	2,809	402	8	4	0	3	----	----	----	28	1.0
Group C												
8	212	1,696	190	15	4	1	[1]2	----	----	----	34	2.0
7	89	623	87	1	1	----	----	----	----	----	3	3.4
6	37	222	35	2	----	----	----	----	----	----	2	5.4
Total	417	2,809	391	18	5	1	2	----	----	----	39	1.4
Group F												
8	212	1,696	210	2	----	----	----	----	----	----	2	.1
4	16	64	15	1	----	----	----	----	----	----	1	1.6
Total	417	2,809	414	3	----	----	----	----	----	----	3	.1
Group G												
8	212	1,696	203	[1]7	2	----	----	----	----	----	11	.6
7	89	623	83	2	[2]3	----	----	----	[2]1	----	14	2.2
6	37	222	34	1	2	----	----	----	----	----	5	2.3
4	16	64	15	1	----	----	----	----	----	----	1	1.6
Total	417	2,809	398	11	7	----	----	----	1	----	31	1.1

[1] Includes 2 children who, on 1 occasion, were found to have group A organisms plus organisms of another group simultaneously. In table 1 these children are listed in group A columns only, thus accounting for apparent discrepancies in numbers of cultures of groups other than group A.

[2] Includes 1 such child as above.

Table 7. Antistreptolysin O (ASO) titers of 996 serums taken from 356 children, by bacteriological category of child

Numerical rank	ASO titer	Bacteriological category [1]								Total serums
		I		II		III		IV		
		Number of serums	Percent	Number of serums	Percent	Number of serums	Percent	Number of serums	Percent	
1	<12	99	16.6	5	2.5	5	4.6	1	1.1	110
2	12	157	26.3	22	10.8	28	25.7	10	11.5	217
3	50	77	12.9	28	13.7	8	7.3	23	26.5	136
4	100	75	12.6	41	20.2	10	9.2	15	17.3	141
5	125	72	12.1	38	19.2	16	14.7	10	11.5	137
6	166	91	15.1	47	23.2	23	21.1	16	18.4	177
7	250	13	2.2	17	8.4	6	5.5	9	10.4	45
8	333	4	.7	4	2.0	8	7.3	1	1.1	17
9	500	3	.5	0	-------	4	3.7	1	1.1	8
10	625	5	.8	0	-------	0	-------	1	1.1	6
11	833	1	.2	0	-------	1	.9	0	-------	2
Total	-------	597	100.0	203	100.0	109	100.0	87	100.0	996
Number of children		223		70		34		29		356
Average number serums per child		2.7		2.9		3.2		3.0		2.8
Titers of 166 or above		117	19.6	68	33.5	42	38.5	28	32.2	[2] 255
Titers of 250 or above		26	4.4	21	10.3	19	17.4	12	13.8	[3] 78
Average ASO titer		81		119		134		120		100
Average peak ASO titer		97		134		209		138		119
ASO index		3.5		4.6		4.6		4.4		4.0

[1] I. Children with no beta hemolytic streptococci or group B only; II. children with nontypable strains of group A beta hemolytic streptococcus, either alone or in combination with other groups; III. children with typable strains of group A beta hemolytic streptococcus at least once, either alone or in combination with other groups; IV. children with group C or group G beta hemolytic streptococcus, or both.

[2] 25.6 percent.

[3] 7.7 percent.

groups, were isolated demonstrated approximately the same average antistreptolysin O titer and index as those with nontypable group A streptococcus. Analysis of the peak antistreptolysin O titers indicated that the average peak was lowest in children from whom no beta hemolytic streptococci were isolated, higher in those with group C and group G or nontypable group A streptococcus, and highest in children with typable strains of group A organisms.

The number and percentage of serums with titers of 166 and above, as well as those of 250 and above, are also listed for each of the 4 bacteriological categories. Where beta hemolytic streptococci were isolated, the percentage of high titers was greater than where these organisms were not recovered.

Discussion

The present study confirms our preliminary impression (*4*) that the low incidence of rheumatic fever, when diagnosed in conformity with Jones' criteria (*11*), and of rheumatic heart disease in Miami, Fla. (*1*), cannot be attributed to the infrequency of group A beta hemolytic streptococcus in this "tropical" climate. The finding of group A beta hemolytic streptococcus in the throats of 126 of the total of 417 children (30.2 percent) or 35.9 percent of the average monthly attendance figure of 351 children in three Miami schools during the 8-month period, October 1953 through May 1954, demonstrates that those organisms were common in this area. Additional studies now in progress in 900 children attending the first three grades in 36 other

schools in Dade County, Fla., further indicate that this rate can be applied to the entire school population in the 6- to 9-year age group.

The streptococcal recovery rate must be considered minimal since no throat swabs were taken from absentees and no data on therapeutic use of antibiotics were available. If many of the absences were due to streptococcal infections, collection of throat swabs from these children during their absence might have yielded a higher recovery rate.

Furthermore, the rate must be considered minimal for other reasons. The technical impossibility of swabbing the faucial surfaces in their entirety resulted in the loss of some organisms. The use of dry swabs as well as the time required to collect all specimens, return them to the laboratory, and plate them might have resulted in death of some streptococci. The mechanics of preparing streaked plates undoubtedly led to some loss. Some organisms probably failed to survive after plating, while others, lacking in streptolysin S, did not cause surface hemolysis, and therefore these colonies might have escaped recognition. Subsurface plating initially would have demonstrated organisms containing streptolysin O, but such a procedure was impractical in our study.

Finally, our observation that the use of a single initial throat swab and plate would have caused the recovery rate to appear 25–35 percent lower than it actually was leads us to speculate that had third, fourth, or even more initial throat swabs and plates been used, the rate might have been higher.

Despite these valid objections to accepting our recovery rate as a true index of incidence or prevalence, the figures observed provide irrefutable evidence of the minimum frequency of occurrence of beta hemolytic streptococci.

Before drawing any conclusions as to the significance of the presence of group A beta hemolytic streptococccus in such a large proportion of the children studied, let us consider three possibilities regarding the host-organism relationship in these cases.

1. Is group A beta hemolytic streptococcus a harmless inhabitant of the throat with no systemic effect on the host? We cannot definitely answer this question as yet. Our studies thus far lead us to believe that in most cases this is not so. Antistreptolysin O determinations showed higher average titers and an increased percentage of high titers associated with the presence of group A beta hemolytic streptococcus, suggesting that the organisms found in the throat evoked a systemic response. School attendance records, observations at the time throat swabs were taken, and nurses' followups indicated that about half of the children with positive cultures had respiratory illnesses (colds, "virus infections," tonsillitis, bronchitis, pneumonia, ear infection) either immediately before, during, or after the time that their throat specimens were cultured. These records did not include data on therapy.

2. Does the finding of group A beta hemolytic streptococcus reflect an infectious process (clinical or subclinical)? If an elevation in antistreptolysin O titer is indicative of previous clinical or subclinical streptococcal infection, our overall serologic findings would support this hypothesis.

3. Does the finding of group A beta hemolytic streptococcus signify the postinfection carrier state? The postinfection carrier state may have existed in 24 of the 126 children from whom group A organisms were isolated. Streptococci were recovered from these 24 children during October 1953, the first month of the study, and we have no way of determining whether these were new isolates or whether they had persisted from previous months. In the remaining 102 children (26 percent) from whom streptococci were isolated for the first time after their throat cultures had been negative for at least 1 month, we may exclude the postinfection carrier state. The persistence of streptococci in the throats of children over a period of months may reflect either a continuing infectious process or the postinfection carrier state. Our current studies, in which we are attempting to correlate more closely the serologic with the bacteriological findings, may clarify this point.

It is significant that despite repeated recovery of beta hemolytic streptococci from their throats, none of the children in the three schools studied developed active rheumatic fever, nor was there a single case of scarlet fever.

A number of investigators (*12–16*) have implicated group A, types 12 and 4, beta hemolytic streptococcus in the pathogenesis of glomerulonephritis. None of the children, in either our pilot or present study, from whom type 12 or type 4 group A beta hemolytic streptococcus was isolated, developed clinical glomerulonephritis. The "nephritogenicity" of these strains is considered elsewhere (*4, 17*). The predominance of type 12 in both of our studies indicates that this type was common in the schools studied and did not represent an isolated "epidemic" in February through May 1953, when it was the only type recovered.

We are still investigating the significance of groups B, C, and G beta hemolytic streptococci in relationship to illness in Dade County. Groups C and G evoked at least one type of systemic response, as evidenced by the higher average antistreptolysin O titer of children harboring these groups of streptococci compared with that of children from whom no beta hemolytic streptococci or only group B streptococci were recovered.

When considered in terms of the rheumatic fever picture in Miami, Fla., our observations suggest that the low rate of the disease cannot be attributed to the following:

1. Infrequency of group A beta hemolytic streptococcus.
2. Difference in groups or types of beta hemolytic streptococci compared with those encountered in other areas.
3. Lack of immunological response of the host, as determined by antistreptolysin O titers.

The answer probably lies "in some alteration in the pattern of the etiological relationship presumed to exist between group A beta hemolytic streptococci and rheumatic fever" (*4*) other than variations in incidence, frequency, or type of organisms.

Variations in the virulence of the organism or differences in degree or pattern of the host's immunological response to the organism may be responsible for the low rheumatic fever rate in Dade County, Fla. Also to be considered in the pathogenesis of the disease is the possible role of a virus-streptococcal combination (*18*). All of these factors probably are influenced by geography and climate.

Summary

1. Throat swabs were taken monthly from October 1953 through May 1954 from 417 children in grades 1 and 2 in three schools in Miami, Fla. In all, 2,809 pairs of throat swabs were collected, representing an average of 6.7 swabs per child and 351 children per month.

2. Group A beta hemolytic streptococcus was isolated from the throats of 126 (35.9 percent) of the children at least once during the 8-month period.

3. Nine types of group A beta hemolytic streptococcus were isolated; in order of frequency, these were types 12, 1, 4, 3, 28, 31, 33, 25, and 44.

4. One hundred eighty-nine children who participated in a pilot study (February through May 1953) were carried over into the present program. Of these, 29 had harbored beta hemolytic streptococci in the pilot study. Twenty-one (72 percent) continued to carry streptococci in their throats; 14 (48 percent) had the same group of beta hemolytic streptococcus or the same type of group A organism.

5. Sixty children harbored group A beta hemolytic streptococcus in their throats on more than one occasion during the 8-month study. Twenty-six of these children had participated in the pilot study; 8 had been positive for group A organisms; an additional child had carried a nongroupable organism.

6. The percentage of positive isolates was approximately the same in the first graders as in the second graders.

7. Antistreptolysin O titers of children with groups A, C, and G beta hemolytic streptococcus were higher than those of children from whom no beta hemolytic streptococci or only group B were recovered.

8. The findings are discussed from the standpoint of several possible types of host-organism relationship.

9. None of the children from whom group A beta hemolytic streptococcus was isolated developed active rheumatic fever or scarlet fever, nor was clinical glomerulonephritis noted among any of the children, including those from whom a strain of type 12 or type 4 group A beta hemolytic streptococcus was isolated.

10. The low rheumatic fever rate in Miami, Fla., is discussed in view of these findings.

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Departmental Announcement

Edmund Baxter has been appointed as the regional director of Region III, Department of Health, Education, and Welfare, Charlottesville, Va.

Mr. Baxter has approximately 20 years of Government service, mostly with the Department of Health, Education, and Welfare and its predecessor agency. He has served for the past 3 years as consultant for special institutions in the Office of the Secretary. Prior to that, he was in charge of the program under which allotments of critical materials were made to schools, colleges, hospitals, and welfare institutions.

Mr. Baxter is a graduate in public administration of the University of Louisville. He served during World War II as a naval officer in the Pacific.

LePrince, Malaria Fighter

WITH HIS DEATH on February 10, 1956, at the age of 80 in Memphis, Tenn., Col. Joseph Albert Augustin LePrince ended his long fight against malaria and yellow fever. A Public Health Service sanitary engineer since 1914, he began his campaign against vector mosquitoes in 1901, in Havana, as a civilian assistant to Maj. Gen. William Crawford Gorgas. At a time when many still doubted the evidence adduced by Carlos Finlay, Dr. Walter Reed, Sir Ronald Ross, and others, LePrince insisted on all-out mosquito control. Thanks in large part to his pioneer services, malaria is no longer a disease of economic importance in the United States.

On learning of the death of LePrince, Assistant Surgeon General Mark D. Hollis, chief engineer of the Public Health Service, said:

"Joseph LePrince received many honors during his lifetime, but knowing him as I did, I am sure that his greatest pride came from the knowledge that his work helped to wipe out some of the deadliest scourges the world has ever known. He is a great and true inspiration to those who carry on his work today."

LePrince achieved international acclaim as the right-hand man of Gorgas in the control of tropical diseases in Cuba and the Panama Canal Zone while the canal was under construction. His name will be remembered in Mexico, Puerto Rico, and other parts of Central America as one who came to serve his fellow man and served him well. He was a practical humanitarian who left the world deeply in his debt.

Son of the man posthumously honored as the father of the motion picture, LePrince was born August 3, 1875, in Leeds, England. He came to this country at the age of 12. In 1901, 3 years after his graduation from Columbia University with civil engineering and master's degrees, he boarded ship for Havana, Cuba, on a 60-day assignment that was to last 14 years. President Theodore Roosevelt had given Gorgas full power to make the mosquito-infested island safe for our occupation forces after the Spanish-American War.

In Cuba, LePrince directed the actual work that changed Havana from a death trap of yellow fever to a tourist mecca. Within 3 months, with 2 inspectors, and at a cost of less than $5,000, he eradicated yellow fever by eliminating mosquito-producing sources. In the process, he conducted basic studies that were to serve generations to follow.

From 1904 to 1914, LePrince, as chief sanitary inspector of the Isthmian Canal Commission and as public health officer in Panama, applied his Cuban experience to rid the "Big Ditch" of tropical diseases. In an intensive 14-month engineering campaign, he and his field men charted rainfall curves, traced watercourses, drained waterholes, converted marshes, removed jungles, and attacked propagation areas with oils and larvicides. At the same time, he was busy organizing fumigation brigades and trying to win the cooperation of householders and local authorities.

A byproduct of the campaign was a series of brilliant ecologic experiments by LePrince on the flight range and breeding habits of the mosquito which contributed to the virtual elimination of the vector of yellow fever, *Aedes aegypti*, and of the anophelines, carrier of the malarial parasites.

LePrince discovered that anopheline mosquitoes will sometimes travel a mile though a half mile is their usual flight. He found that "Madam Anopheles," as he called his foe, seeks

shelter from the wind. When *Anopheles* enters a house, it nearly always enters from the leeward side.

He learned that malaria mosquitoes avoid sunlight, rarely bite in the daytime, and then only in the shade. Their larvae are easily frightened and for long intervals remain hidden under water.

He noted that the puddles in hoofprints of cows and horses were important producers of certain *Anopheles* species; that green algae on water surfaces harbored larvae; that some areas produced a species of *Anopheles* only at certain times; that thousands of mosquitoes traveled from the swamps to human settlements each and every night; and that the *Anopheles* seemed to know exactly where it wanted to go.

He disproved the theory that anophelines were brought into towns by strong winds blowing from the marshes. When traps set in a vacant house failed to attract mosquitoes, LePrince and his men, by sleeping there, proved that it was the mosquitoes' strong sense of smell and their liking for the odor of human perspiration that brought them to their victims. He observed that some people were more attractive to *Anopheles* than others.

He learned that mosquitoes were carried on the clothing of passengers who traveled for long distances in trains at night; that they would remain on a man's coat during a stiff wind; that they gained entrance to screened dwellings by being carried in on dark clothing, where they rested undetected.

Screening of dwellings in Gatun, Colon, Panama City, and elsewhere along the 40-mile stretch of the canal was carried out on a scale never before attempted anywhere. When LePrince ordered the headquarters of the Canal Commission screened, the architect, who was new to the tropics, joked about the fuss made over the screening and delayed following the order. A month later he was dead of yellow fever.

LePrince not only faced indifferent cooperation. He was ridiculed. His destruction of Santa Ana Park in Panama City aroused public hostility. He was called an insect chaser and a crackpot. But he permitted no obstacle to dampen his ardor for his task.

The long-awaited details of the yellow fever and malaria campaigns were revealed to the world in 1916 when LePrince published "Mosquito Control in Panama." This report on what he had learned in the Canal Zone and Havana was to remain a bible for mosquito control workers for many years. It is still a classic guide on environmental controls for certain mosquito species.

In the introduction to LePrince's historic work, Dr. L. O. Howard, then chief of the Bureau of Entomology, United States Department of Agriculture, recalled a conversation with Gorgas and LePrince before they left for Panama.

Howard had asked the general whether he would send specimens of all Panama mosquitoes to the bureau for naming. The general replied: "I will assign Mr. LePrince to see that it is done." Whereupon, LePrince remarked, "I will have to do it soon, Doctor, for in a year or so there will be no mosquitoes there."

Another anecdote about LePrince was supplied by the renowned Public Health Service epidemiologist, Dr. Leslie L. Lumsden. Lumsden told of sitting behind LePrince at a meeting where someone reading a paper on malaria was quoting liberally from LePrince's book without attribution. Lumsden asked LePrince how he liked having his "stuff" used without credit. The old man's eyes shone. "Just fine, because then I know he thinks it's good."

LePrince was equally famous for his malaria successes in the United States. He continued his war against the mosquito from Public Health Service headquarters in Memphis. His brilliant achievements in the Caribbean had convinced the Service that malaria could be controlled economically in the continental United States.

During World War I, LePrince had charge of malaria control in 28 Army and Navy installations in the eastern and southeastern United States. His methods of mosquito control resulted in a malaria rate in the Army during World War I that was less than 1 percent of the rate in the Spanish-American War. The control achieved by LePrince and other Service engineers in the postwar period anticipated the industrial development of the southern States.

The Public Health Service loaned LePrince

to Mexico in 1923 to develop malaria control in the oil fields. In 1927 he directed malaria control activities in the Mississippi River area for the American Red Cross. In 1935 he became consultant on malaria control to the Tennessee Valley Authority. He was called back to the Caribbean area in 1938 to assist the Puerto Rican Government in a serious malaria outbreak. In 1940, a year after his retirement from the Public Health Service, he helped solve malaria control problems resulting from the building of dams on the upper Mississippi River.

As the world grew to appreciate his efforts, LePrince received many honors. He held the greatly prized Ross Medallion awarded by the London School of Tropical Medicine. He received an honorary doctorate of science from Southwestern at Memphis in 1945. In 1951 the National Malaria Societies chose him to receive the first Joseph Augustin LePrince Award, named for him and bestowed on him because of his outstanding accomplishments in malaria control.

LePrince died in the Public Health Service Hospital in Memphis. He is survived by his widow, the former Julia Mercedes Lluria, of Havana, and by his son, four daughters, five grandchildren, and one great-grandchild.

LePrince closed his 1916 classic report with a prophetic statement, made in 1911 by James Bryce, Ambassador from England to the United States:

"In modern times most of the events of highest ultimate significance have been discoveries in the realms of nature or inventions in the realm of industry; and their magnitude is seldom known at first. Little was said of the discovery that mosquitoes are the carriers of yellow fever and the intermittent fevers, yet what immense consequences are already seen to flow from the determination of that fact!"

Training in Insect and Rodent Control

Training courses in insect and rodent control are being offered in Atlanta, Georgia, during September, October, and November 1956, by the Training Branch of the Communicable Disease Center, Public Health Service. These courses are based on the extensive experience of the Communicable Disease Center in investigations and operations in the vector control field and are primarily for personnel of Federal, State, and local health departments. Training in both the laboratory and the field is included, designed to give a working knowledge of the control of insects and rodents affecting the health and well-being of man.

A course in insect control, which gives principal attention to the control of mosquitoes, flies, and other insects occurring in and around homes and food-handling establishments, is scheduled for September 17–28, 1956.

Training in rodent control, October 1–12, includes instruction in the control of domestic rodents and rodentborne diseases.

A course covering mosquito control will be given November 5–9, 1956.

A special advanced 2-week course in the biology and identification of arthropods of public health importance is scheduled for December 10–21, 1956. This course, which uses the extensive insect collection of the Communicable Disease Center, is particularly useful for entomologists and biologists and others interested in proper identification of arthropods of public health importance such as flies, fleas, ticks, and mosquitoes.

Other courses in insect and rodent control are scheduled for March, April, and May 1957.

Interested persons should apply through their organizations to the Chief, Training Branch, Communicable Disease Center, Public Health Service, 50 Seventh Street NE, Atlanta 23, Ga.

Mosquitoes and Encephalitis *in the* Irrigated High Plains of Texas

By FRED C. HARMSTON, B.S., GEORGE R. SHULTZ, B.C.E., RICHARD B. EADS, Ph.D., and GEORGE C. MENZIES, M.S.

THE OCCURRENCE of human and equine encephalitis in the High Plains of northwestern Texas during 1940–50 and, particularly, the increased prevalence among humans in 1952 aroused the interest of local, State, and Federal public health officials. The possible relationship between conditions associated with the expansion of irrigation and the increase in encephalitis virus infections led to cooperative investigations in the Texas High Plains by the Public Health Service and the Texas State Department of Health during 1953–54.

Irrigated cropland on the Texas High Plains increased from 250,000 acres in 1940, to 1,860,000 acres in 1950 (*1*). Deep wells are the principal source of irrigation water for this area; the effluent from municipal sewage treatment plants is also used in some localities. The spectacular expansion of irrigation has caused major changes in the population, in agricultural practices, and in the economy of the region.

Records of the Texas State Department of Health and those of the Animal Disease and Parasite Research Branch, Agricultural Research Service, United States Department of Agriculture, show that cases of human and equine encephalitis were reported from irrigated sections of the Texas High Plains during most years of the period 1940–54. Outbreaks of the disease in humans occurred in 1952 and 1954, when 23 and 32 cases, respectively, were reported; 16 cases were reported in 1944 and 11 in 1953. The reported equine cases ranged from 3 in 1942 to 26 in 1944; 25 cases were reported in 1952.

Preliminary surveys were made in the vicinity of Lubbock and Plainview during the period August–October 1953 to obtain information on mosquito populations and the factors involved in their production. These surveys indicated that mosquito problems of public health significance occurred in the Texas High Plains and that the problems were related to both agricultural and municipal use and disposal of water.

In 1954, detailed entomological-engineering investigations were conducted throughout the season in representative areas of the Texas High Plains to determine: (*a*) the kinds and relative abundance of adult mosquitoes in urban and rural localities; (*b*) the frequency with which mosquitoes were infected with encephalitis

Mr. Harmston, a biologist, and Mr. Shultz, a sanitary engineer, are with the Logan Field Station Section of the Communicable Disease Center, Public Health Service, Logan, Utah. Dr. Eads is in charge of the entomology section, bureau of laboratories, Texas State Department of Health, Austin.

Mr. Menzies died in January 1956 of rabies, probably contracted during the course of bat rabies investigations. At the time of his death he was senior entomologist, entomology section, Texas State Department of Health.

viruses; (*c*) the specific conditions that resulted in mosquito production; and (*d*) the causes and possible corrections of these conditions.

The Texas High Plains

The High Plains of Texas cover approximately 20,000 square miles in the northwestern part of the State. They extend southward from the Canadian River Valley to the Pecos River Valley, a distance of about 200 miles. The region is bounded by an abrupt escarpment on all sides except the south, where it merges gradually into the lower, eroded plains bordering the Pecos River Valley. This vast tableland rises above the adjoining country by heights ranging from 50 to 300 feet. Its elevation above mean sea level varies from about 4,400 feet in the northwest to less than 3,000 feet in the southeast. The surface is flat to gently undulating, and has a generally uniform slope toward the east and southeast, averaging about 10 feet per mile.

Numerous playas, a few low hummocks, and small stream valleys provide the only prominent natural land features. Of these, the undrained natural depressions, or playas, are by far the most significant. The playas are scattered rather uniformly over the area, averaging about one per square mile. They range in size from less than 10 to more than 2,000 acres, and average 20 to 30 feet in depth. The playas are usually dry during the winter months but may be flooded during the growing season by surface runoff and irrigation waste water.

The climate of the region is typically semiarid, characterized by a dry atmosphere, hot summers, short, cold winters, and a large proportion of sunny days. The annual rainfall averages about 20 inches, with nearly three-fourths occurring during April through September. Evaporation losses are estimated at 99 percent of the average annual rainfall (*2*).

The irrigated area within the Texas High Plains comprises nearly 15,000 square miles and extends approximately 140 miles south from Amarillo. The predominant soil types throughout the irrigated areas are fine sandy loams and clay loams, both of which readily absorb water and therefore afford good vertical drainage. These soils are very productive under irrigation. The principal field crops are grain sorghum, cotton, small grains, alfalfa, and pasture. Irrigated truck crops, including potatoes, onions, and lettuce, are grown in some sections.

Methods

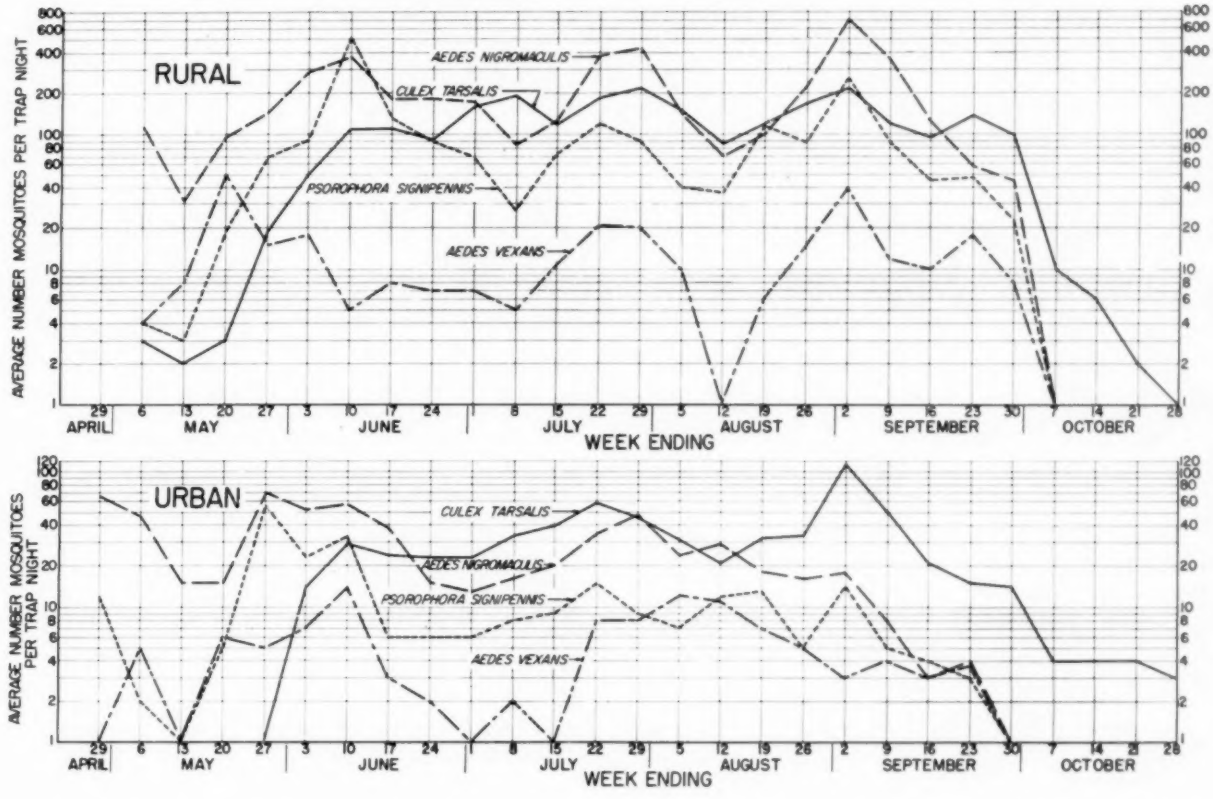
Between April 26 and October 28, 1954, adult mosquito populations in urban and rural areas

Table 1. Relative abundance of major mosquito species (females) in light trap collections, Texas High Plains, April 26–October 28, 1954

Species	Percentage of total specimens collected								
	Plainview		Hereford		Other localities [1]		All locations		
	Urban (1 trap)	Rural (4 traps)	Urban (1 trap)	Rural (1 trap)	Urban (3 traps)	Rural (1 trap)	Urban (5 traps)	Rural (6 traps)	Total (11 traps)
Aedes nigromaculis	36	46	6	10	12	45	19	44	41
Culex tarsalis	26	24	76	70	59	14	50	24	28
Psorophora signipennis	13	21	7	16	8	32	9	22	20
Psorophora discolor	9	4	<1	1	1	4	3	4	4
Aedes vexans	8	3	1	<1	1	3	3	3	3
Culex quinquefasciatus	2	<1	8	1	16	<1	11	1	2
Aedes dorsalis	5	1	<1	<1	2	1	3	1	1
Other species [2]	1	1	1	2	1	1	2	1	1
Total number of specimens	11, 047	189, 675	2, 911	4, 895	23, 364	24, 616	37, 322	219, 186	256, 508
Total number of trap-nights	120	402	98	130	437	82	655	614	1, 269

[1] Urban traps located at Lubbock, Abernathy, and Hale Center; rural trap located near Kress. [2] Includes *Anopheles pseudopunctipennis, Anopheles punctipennis, Culex erraticus, Culex erythrothorax, Culiseta inornata, Psorophora ciliata, Psorophora cyanescens,* and *Uranotaenia syntheta.*

Figure 1. Seasonal abundance of adult female mosquitoes collected at rural and urban sites, Plainview and Hereford study areas, Texas High Plains, 1954.



were sampled by means of standard New Jersey light traps. Eleven traps, 5 urban and 6 rural, were operated from dusk to dawn at Plainview, Abernathy, Hereford, Hale Center, and Kress.

To determine the kinds and relative abundance of mosquitoes that attack man in the evening, biting collections were made at weekly intervals from July 20 to October 12 near the light trap sites in the town of Plainview and surrounding rural areas. The collections were made during 3 consecutive 15-minute periods beginning at sunset. Mosquitoes were caught by means of a killing tube or aspirator from the exposed legs of the collector. In contrast to the landing rate observations which are frequently made, these collections included only mosquitoes which had actually started to bite.

To obtain mosquitoes for encephalitis virus recovery tests, females of *Culex tarsalis* and other species were collected from diurnal resting shelters in urban and rural areas of Hale, Lubbock, and Swisher Counties from June 22 to October 26. The mosquitoes were collected with an aspirator and transferred to small bobbinet cages. They were held overnight and then shipped alive by air express to the State health department laboratory in Austin, Tex. The cages containing the live mosquitoes were enclosed in an insulated cardboard carton along with two frozen gel units for cooling purposes. Shipping techniques were adapted from those described by Brennan and Mail (*3*).

The mosquitoes invariably arrived at the laboratory in good condition after a 4-hour trip from Plainview. Upon arrival, they were anesthetized, identified, macerated, and suspended in buffered broth. The suspension was inoculated into infant mice, young adult mice, or day-old chicks. Suspicious material was inoculated into guinea pigs from which blood specimens were taken 21 to 30 days later and tested by complement fixation for western equine, eastern equine, and St. Louis encephalitis viruses.

Detailed mosquito production studies were made between April 20 and October 29 on plots

located in the vicinity of Plainview and Hereford. These plots were generally representative of irrigated areas in the Texas High Plains. At Plainview the study plots consisted of 22 sections (one square mile each), which included parts of the town and the surrounding agricultural area where diversified field crops were grown under irrigation. Sorghum and cotton were the principal crops and together comprised 77 percent of the total irrigated area (9,095 acres) on the plots. The combined acreage of alfalfa, small grains, pasture, corn, and Sudan grass accounted for the remaining 23 percent of the irrigated area. A small amount of pastureland on these plots was irrigated with treated sewage effluent. At Hereford the study plot included an area of approximately 6 square miles in which field and truck crops were grown under intensive irrigation. Sorghum and small grains were grown on 63 percent of the total irrigated area (3,395 acres) on the study plot, and truck crops including potatoes, lettuce, and onions covered 34 percent. Small acreages of cotton and alfalfa were grown under irrigation on the remainder of the plot. The furrow method of irrigation was employed on 82 percent of the irrigated cropland on the Plainview plots and on 94 percent of the irrigated acreage on the Hereford plot. Maps of the study plots were prepared showing the location and types of mosquito breeding places, location of wells and irrigation distribution systems, field boundaries, field acreages, crops, and methods and direction of irrigation.

Table 2. Relative abundance of mosquito species taken on human hosts within 45 minutes after sunset in weekly biting collections near the light trap sites, Plainview, Tex., July 20–October 12, 1954

Species	4 rural sites [1]		1 urban site [1]	
	Number	Percent	Number	Percent
Aedes nigromaculis	626	37	92	12
Aedes vexans	562	34	514	69
Culex tarsalis	357	21	100	14
Aedes dorsalis	38	2	20	3
Psorophora discolor	34	2	1	<1
Psorophora signipennis	26	2	8	1
Anopheles punctipennis	16	1	0	0
Culex erraticus	5	<1	0	0
Culiseta inornata	1	<1	3	<1
Culex erythrothorax	0	0	1	<1
Total	1, 665	100	739	100

[1] Forty-nine periods of 15 minutes.

Table 3. Number of female mosquitoes processed for encephalitis virus isolations, Texas High Plains, June 22–October 26, 1954

Species	Counties from which collected			Total
	Hale	Lubbock	Swisher	
Culex quinquefasciatus	1, 625	1, 647	52	3, 324
Culex tarsalis	350	590	375	1, 315
Anopheles punctipennis	0	52	0	52
Anopheles pseudopunctipennis	0	42	0	42
Total number of specimens	1, 975	2, 331	427	4, 733
Total number of collections	14	16	4	34

Potential mosquito breeding places were arbitrarily classified into five types: playa lakes, surface pools, irrigation laterals, borrow pits and roadside ditches, and stream margins. All temporary water areas on the study plots were sampled for mature larvae and pupae following each flooding. The permanent and semipermanent water areas were sampled once each week. Each water area was sampled with a pint-size, white-enamel dipper; the number of dips taken was proportionate to the extent of the breeding area. When mature larvae were present, representative samples were collected for identification. During each inspection, the data obtained included: (*a*) the average number of fourth-instar larvae and pupae per dip, (*b*) an estimate of the total water area, (*c*) an estimate of the breeding area, and (*d*) the source of water.

In order to evaluate the relative mosquito production potential of the various habitats on the plots, production indexes were determined by use of the following formula:

Production index = (average number of fourth-instar larvae and pupae per dip) × (breeding area in acres).

In addition to the detailed investigations on the plots at Plainview and Hereford, weekly

mosquito production studies were made in the following habitats associated with municipal sewage disposal: (*a*) the sewage lagoon at Abernathy, (*b*) the oxidation ponds at Petersburg, and (*c*) the sewage polluted streams at Plainview and Tulia.

Adult Mosquito Populations

The relative abundance of the major mosquito species collected in 5 urban and 6 rural light traps is presented in table 1. A total of 256,508 females, representing 16 species, was taken during 1,269 trap-nights from April 26 to October 28. The average nightly collection of all species was 202 for all locations combined, 385 at Plainview, 34 at Hereford, and 92 for the other four localities together.

A total of 37,322 female mosquitoes was collected in the 5 urban traps. Of these, the predominant species were *C. tarsalis*, 50 percent; *Aedes nigromaculis*, 19 percent; *Culex quinquefasciatus*, 11 percent; and *Psorophora signipennis*, 9 percent. Of 219,186 females taken in the 6 rural traps, *A. nigromaculis* comprised 44 percent; *C. tarsalis*, 24 percent; and *P. signipennis*, 22 percent. The average nightly collection of all species in the rural traps was 357, as compared with 57 in the urban traps. The average collection per trap-night and the seasonal distribution of the major species for both urban and rural sites at Plainview and Hereford (the two principal study areas) are shown by weekly periods in figure 1.

Figure 2. Mosquito production by habitat and source of water, Plainview study area, Texas High Plains, 1954.

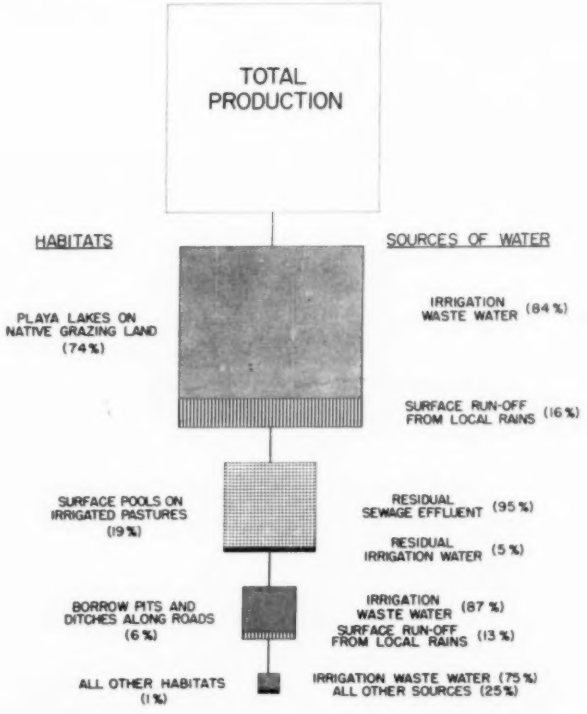
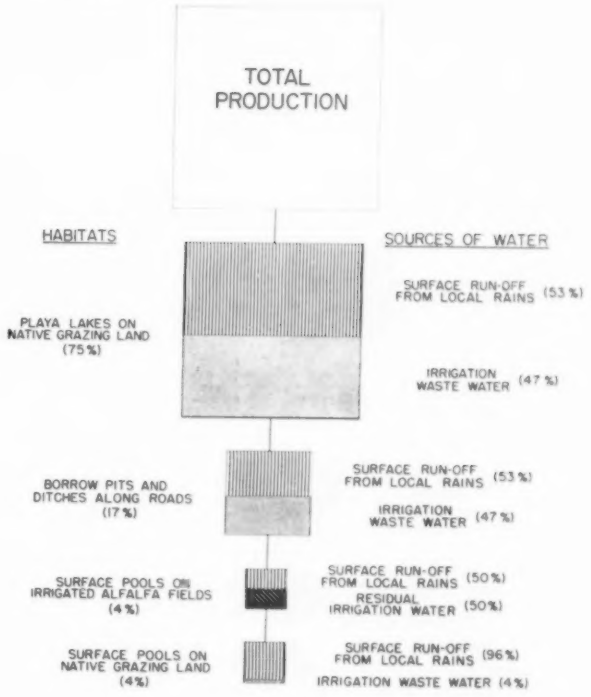

TOTAL PRODUCTION
HABITATS
SOURCES OF WATER
PLAYA LAKES ON NATIVE GRAZING LAND (74%)
IRRIGATION WASTE WATER (84%)
SURFACE RUN-OFF FROM LOCAL RAINS (16%)
SURFACE POOLS ON IRRIGATED PASTURES (19%)
RESIDUAL SEWAGE EFFLUENT (95%)
RESIDUAL IRRIGATION WATER (5%)
BORROW PITS AND DITCHES ALONG ROADS (6%)
IRRIGATION WASTE WATER (87%)
SURFACE RUN-OFF FROM LOCAL RAINS (13%)
ALL OTHER HABITATS (1%)
IRRIGATION WASTE WATER (75%)
ALL OTHER SOURCES (25%)

Figure 3. Mosquito production by habitat and source of water, Hereford study area, Texas High Plains, 1954.


TOTAL PRODUCTION
HABITATS
SOURCES OF WATER
PLAYA LAKES ON NATIVE GRAZING LAND (75%)
SURFACE RUN-OFF FROM LOCAL RAINS (53%)
IRRIGATION WASTE WATER (47%)
BORROW PITS AND DITCHES ALONG ROADS (17%)
SURFACE RUN-OFF FROM LOCAL RAINS (53%)
IRRIGATION WASTE WATER (47%)
SURFACE POOLS ON IRRIGATED ALFALFA FIELDS (4%)
SURFACE RUN-OFF FROM LOCAL RAINS (50%)
RESIDUAL IRRIGATION WATER (50%)
SURFACE POOLS ON NATIVE GRAZING LAND (4%)
SURFACE RUN-OFF FROM LOCAL RAINS (96%)
IRRIGATION WASTE WATER (4%)

The relative abundance of biting mosquitoes collected at weekly intervals on human hosts in the town of Plainview and in surrounding rural areas is shown in table 2. Of 2,404 mosquitoes taken in 98 collecting periods of 15 minutes each, *C. tarsalis*, the primary vector of western equine encephalitis, *A. nigromaculis*, and *Aedes vexans* were the principal species at both rural and urban sites. At the rural sites, the average attack rate for all species combined was 34 mosquitoes per period, and at urban sites, 15 mosquitoes. Both *A. nigromaculis* and *A. vexans* are severe pest mosquitoes and have been found naturally infected with western equine encephalitis (*4*, *5*); in the laboratory they have been found to be efficient vectors of encephalitis virus (*6*, *7*).

Encephalitis Virus Isolations

From June 22 to October 26, 4,733 female mosquitoes were collected and subsequently processed for encephalitis virus isolations (table 3). Included were 3,324 *C. quinquefasciatus* in 17 pools, 1,315 *C. tarsalis* in 15 pools, 52 *Anopheles punctipennis* in 6 pools, and 42 *Anopheles pseudopunctipennis* in 2 pools. Western equine encephalitis virus was isolated from 4 pools of mosquitoes: 39 *C. tarsalis* collected in restrooms at the city park in Plainview, Hale County, June 29; 80 *C. quinquefasciatus* collected in shrubbery and concrete pits at the sewage treatment plant, Lubbock, Lubbock County, July 27; 118 *C. tarsalis* collected at the same time and place as the *C. quinquefasciatus;* and 51 *C. tarsalis* collected from restrooms at the city park in Plainview, September 7.

Mosquito Production on Study Plots

Data obtained from the Plainview study plots are summarized graphically according to type of habitats and source of water in figure 2. According to seasonal production indexes, approximately three-fourths of all mosquito production on the plots occurred in playa lakes on native grazing land. About 20 percent of the mosquito production occurred in surface pools on irrigated pastures; of this production, 95 percent was on the pasture irrigated with sewage effluent. The only other significant breeding places were borrow pits and ditches along roads, which produced 6 percent of the total. Waste and residual irrigation water accounted for 69 percent of all mosquito production on the Plainview plots, residual sewage effluent (on pasture) 18 percent, and surface runoff from local rains 13 percent.

Figure 4. Species composition of mosquito larvae collected from various aquatic habitats, Plainview study area, Texas High Plains, 1954.

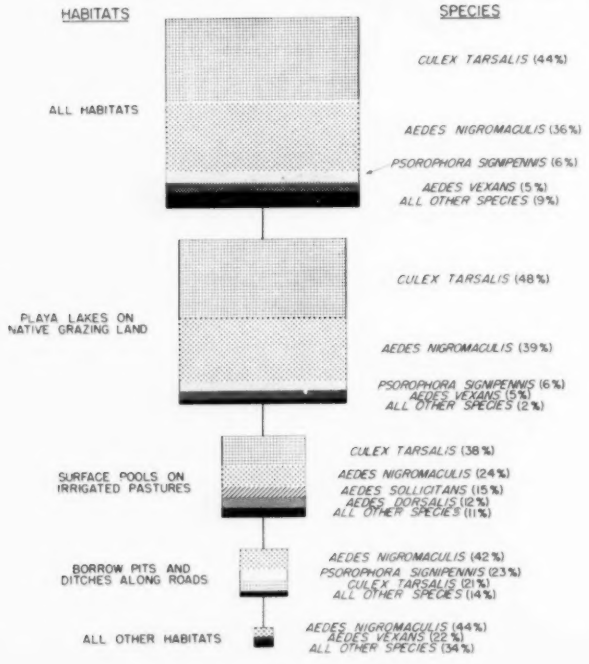
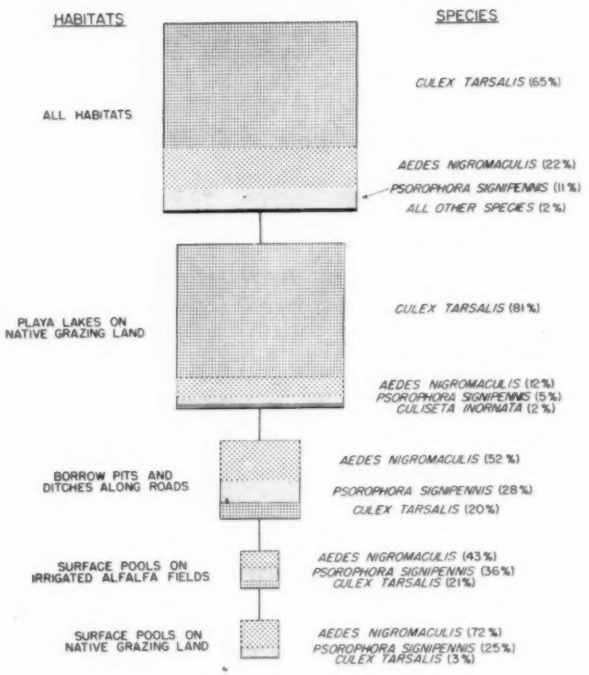


Figure 5. Species composition of mosquito larvae collected from various aquatic habitats, Hereford study area, Texas High Plains, 1954.



On the Hereford study plot, as in the Plainview area, about three-fourths of the mosquito production during the season occurred in playa lakes on native grazing land (fig. 3). Roadside ditches and borrow pits accounted for 17 percent of the mosquito production. Surface pools on irrigated alfalfa fields and on native grazing land were the only other sources of mosquitoes on the plot, each producing 4 percent of the total.

Surface runoff from local rains was the principal source of water in habitats on the Hereford plot (fig. 3). It accounted for 55 percent of the seasonal production index, as compared

with only 13 percent for the Plainview area. Waste water from irrigated fields accounted for 45 percent of the total mosquito production.

On the Plainview study plots, 36,510 larvae, comprising 12 species, were collected and identified (fig. 4). The most abundant species were: *C. tarsalis*, 44 percent; *A. nigromaculis*, 36 percent; *P. signipennis*, 6 percent; and *A. vexans*, 5 percent. Other species collected in smaller numbers included *Aedes dorsalis*, *Aedes sollicitans*, *A. pseudopunctipennis*, *A. punctipennis*, *C. quinquefasciatus*, *Culiseta inornata*, *Psorophora ciliata*, and *Psorophora discolor*. *C. tarsalis* was found in all types of habitats except irrigation laterals and was the predominant species in playa lakes, surface pools on pastures irrigated with sewage effluent, and the margins of the sewage polluted creek. *A. nigromaculis* was common in all habitats except the margins of the sewage polluted creek.

On the Hereford plot, 6,099 larvae, representing 5 species, were collected and identified (fig. 5). The principal species were: *C. tarsalis*, 65 percent; *A. nigromaculis*, 22 percent; and *P. signipennis*, 11 percent. These species were found in all types of habitats. Small numbers of *C. inornata* and *P. discolor* were also collected.

Mosquito Production and Sewage Disposal

Mosquito breeding occurred in all habitats associated with sewage disposal that were studied (table 4). The playa used as a sewage lagoon at Abernathy was by far the most important from the standpoint of total mosquito production. The entire flow of effluent from the Abernathy sewage treatment plant was often diverted for irrigation, which prevented the formation of a permanent lake in the playa. This resulted in marshy conditions in the playa which were very favorable for mosquito production.

The oxidation ponds at Petersburg consisted of a series of cells constructed with steep banks. Prolific production of mosquitoes occurred in densely vegetated portions of cells which were only partially filled because of low flows of effluent. In the cells which operated at normal level, mosquito production occurred only along the vegetated banks. The percentage of total water area that produced mosquitoes in the constructed ponds was much lower than for the natural playa at Abernathy. Mosquito production also occurred along the vegetated margins of the sewage polluted streams at Plainview and Tulia.

Table 4. Larval mosquito data collected from habitats associated with municipal sewage disposal, Texas High Plains, April 20–October 29, 1954

Collection data and species composition	Sewage lagoon (playa) Abernathy	Sewage oxidation ponds (constructed) Petersburg	Creek receiving Plainview sewage	Creek receiving Tulia sewage
Number of inspections [1]	17	27	26	27
Total estimated water area inspected (acres)	37.4	71.0	17.1	12.4
Total estimated breeding area inspected (acres)	13.0	1.3	.4	1.9
Average number of fourth–instar larvae and pupae per dip	34.0	62.5	1.7	8.2
Seasonal production index [2]	443.1	81.3	.7	15.6
	Percentage by habitat of fourth–instar larvae			
Aedes dorsalis	12	0	0	0
Aedes nigromaculis	17	<1	0	0
Culex quinquefasciatus	35	63	6	33
Culex tarsalis	32	35	94	65
Culiseta inornata	3	1	0	<1
All other species [3]	1	<1	0	1
Total number of specimens identified	4,842	6,251	453	3,140

[1] Larval inspections made weekly when water was present. [2] Production index=(average number fourth–instar larvae and pupae per dip)×(breeding area in acres); seasonal production index=summation of production indexes for entire season. [3] Includes *Aedes sollicitans*, *Anopheles punctipennis*, and *Psorophora signipennis*.

C. tarsalis and *C. quinquefasciatus* were the predominant species in all habitats associated with municipal sewage disposal (table 4). These 2 species comprised 88 percent of over 14,000 larvae collected from the 4 habitats. *A. dorsalis* and *A. nigromaculis* together comprised more than one-fourth of over 4,800 larvae taken from the sewage lagoon at Abernathy.

Summary and Conclusions

Detailed studies during 1954 in representative areas of the irrigated High Plains in Texas showed that *Culex tarsalis*, the common encephalitis mosquito, was abundant from early June through September. It ranked second in the total number of female mosquitoes taken in light traps and was the most abundant species in larval collections. In biting collections on human hosts at Plainview, *C. tarsalis* ranked second at urban sites and third at rural sites. *Culex quinquefasciatus* was abundant during the latter part of the season in both urban and rural areas. It ranked third in the urban and sixth in the rural light trap collections. Western equine encephalitis virus was isolated from 3 out of 15 pools of *C. tarsalis*, and from 1 out of 17 pools of *C. quinquefasciatus*.

Aedes nigromaculis ranked first in the total number of female mosquitoes taken in light traps. It also ranked first in the rural and third in the urban biting collections. *Aedes vexans* ranked fifth in the total number of females taken in the light traps, but it ranked first in the urban and second in the rural biting collections. The abundance and widespread distribution of *C. tarsalis*, *C. quinquefasciatus*, *A. nigromaculis*, and *A. vexans*, and the presence of encephalitis virus constitute a significant public health problem in the Texas High Plains.

Playa lakes on native grazing land accounted for approximately three-fourths of the mosquito production in the study areas. Surface pools and roadside ditches and borrow pits were also important sources of mosquitoes. Waste and residual irrigation water accounted for 87 percent of the total mosquito production at Plainview, and 45 percent at Hereford. Practically all of the remaining production was caused by surface runoff from local rains.

Throughout the High Plains area, much of the water that collects in the playas is lost through evaporation and transpiration. This loss of water is vitally important to the economy of the region, because the underground reservoir is being lowered by pumpage for irrigation at a much greater rate than it is being replenished. Various methods of making beneficial use of the water that is now lost from the playas have been suggested, and several are being tested at the present time. These and other water conservation measures should be evaluated from agricultural and mosquito control viewpoints. In this area, as in others, such viewpoints are likely to be served by the same methods. Where mosquito production cannot be eliminated by water conservation measures, chemical control will be necessary.

Mosquito production associated with municipal sewage disposal is not as widespread as that caused by irrigation waste water and surface runoff; however, this is a special problem for which both temporary and permanent control measures are needed.

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Surveys in two areas contribute additional evidence that no hazard of cumulative toxic fluorosis is associated with the use of fluoridated water containing 1 p.p.m. fluoride. Within 1 week, the concentration of fluoride in the urine equaled that in the drinking water for adults. For children, the period of adjustment was considerably longer.

Urinary Fluoride Levels Associated With Use of Fluoridated Waters

By I. ZIPKIN, Ph.D., R. C. LIKINS, D.D.S., F. J. McCLURE, Ph.D., and A. C. STEERE, B.S.

PREVIOUS studies have demonstrated a close correlation between the concentration of fluoride in the urine and the fluoride occurring naturally in drinking water (*1, 2*). Only a limited quantity of data is available, however, concerning the urinary excretion of fluoride added to a municipal water supply (*2–4*). Moreover, it was not determined in any of these studies how soon after beginning the regular ingestion of a fluoride water a stabilized equilibrium is attained, nor was any attempt made to investigate the rate of fluoride excretion in individuals of various ages.

The present study was undertaken, therefore, to provide the following information with respect to fluoridated drinking waters: (*a*) the relation between the level of fluoride in the drinking water and the concentration of fluoride in the urine, (*b*) the time required after fluoridation for this relation to become stabilized, and (*c*) the effect of the age of the individual on the time required for establishment of this equilibrium.

The advent of water fluoridation in Montgomery County, Md., in December 1951 made it possible to obtain such information. Additional, preliminary information was available from Grand Rapids, Mich., where the urinary excretion of fluoride had been under observation since the start of water fluoridation in January 1945. For comparison with the data from these two areas, the results of a survey in 1948 in Aurora, Ill., are presented. The drinking wa-

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John D. Rust and Frederick A. Bullock, formerly with the laboratory, assisted in collecting the specimens in Montgomery County, Md. Virginia L. DuBois, with the Epidemiology and Biometry Branch of the National Institute of Dental Research, assisted in arrangements for collection of the urine specimens in Grand Rapids, Mich. Dr. Albert L. Russell, chief of that branch, made the statistical analysis of portions of the data.

ter in Aurora has contained approximately 1.0 p.p.m. fluoride from natural sources since 1895 (*2*).

Spot Specimens vs. 24-Hour Samples

The difficulties in obtaining 24-hour urine specimens in a study of this extent are obvious. Accordingly, spot specimens from a number of individuals were pooled in equal volumes to provide a sample for fluoride analysis. Early in the study, information was obtained regarding the relation of the fluoride content of spot specimens to that of the 24-hour total volume.

During a 24-hour collection period, spot specimens were taken between 9 and 12 a. m., 2 and 5 p. m., and 8 and 11 p. m., from 9 adult males who were drinking water containing 1.0 p.p.m. fluoride provided as sodium fluosilicate. These samples, as were all samples in the study, were alkalized with calcium oxide prior to evaporation and ashing and analyzed for fluoride according to standard procedures (*5*, *6*). The results are shown in table 1.

The fluoride concentration in a single spot specimen may vary considerably from that in the 24-hour sample. However, according to the *t* test, the mean concentrations for the 3 spot specimens from the 9 men (0.9 p.p.m., 1.0 p.p.m., and 1.1 p.p.m.) did not vary significantly from the mean fluoride concentration of 0.9 p.p.m. for the 24-hour samples.

Table 1. Fluoride concentration (p.p.m.) in spot and 24-hour urine specimens, Montgomery County, Md.

Subject	Spot specimens			Mean of spot specimens	24-hour specimen [1]
	9–12 a. m.	2–5 p. m.	8–11 p. m.		
A	0.3	0.5	0.5	0.4	0.6
B	.4	.5	.5	.5	.5
C	1.5	1.1	1.3	1.3	1.1
D	1.2	1.3	.8	1.1	1.0
E	.8	.9	.8	.8	.8
F	.6	1.5	2.0	1.4	1.2
G	1.5	.8	1.5	1.2	1.2
H	.8	.9	.9	.9	.6
I	1.1	1.5	1.4	1.3	.9
Mean	.9	1.0	1.1	1.0	.9

[1] Corrected for spot specimen analysis.

These results apply to exposure to 1.0 p.p.m. fluoride in the drinking water. They agree very well with the data obtained by Largent and Ferneau for other levels of fluoride (*7*). It appears, therefore, that the fluoride concentration of pooled urine specimens for a group of individuals reflects reasonably well the average fluoride concentration in 24-hour specimens.

Fluoridation of the Drinking Water

Beginning December 28, 1951, the drinking water of Montgomery County, Md., has been fluoridated to approximately 1.0 p.p.m. fluoride by the addition of sodium fluosilicate. The water supplying this area is obtained from the northwest branch of the Anacostia River (*8*). Water samples taken at widely scattered points in the study area for 10-day periods at the time of the urine collections showed approximately 1.0 p.p.m. fluoride after an initial adjustment period lasting 2 to 4 weeks.

The communal water of Grand Rapids, Mich., which is obtained from Lake Michigan, has been fluoridated for more than 10 years with sodium fluoride. The fluoride content has been maintained at a relatively constant level of 1.0–1.1 p.p.m. (*9*).

Sampling Procedures

The subjects studied in Montgomery County were male school children and male adults who had had no exposure to a fluoride-containing drinking water before the start of fluoridation and who were in continuous residence thereafter. Nine age categories, as shown in table 2, were represented. At the start of the study, the subjects in each age category were divided into four groups according to the time of day the specimen was obtained. The same subjects were followed throughout the course of the study. For the age category 5–14 years, the 4 collection periods were 8:30 to 10:30 a. m.; 10:30 a. m. to 1 p. m.; 1 to 2 p. m.; and 2 to 3 p. m. For the age categories 30–34 and 35–39, the first 2 collection periods were the same as for the younger age groups, and the second 2 were: 1 to 3 p. m. and 3 to 5 p. m.

Eleven collections of urine were made during a period of about 3½ years. For the first

10 collections, the subjects remained in their particular group relative to age and time of day. Approximately 10 specimens, 1 from each subject, were obtained for each of the 36 age-time groups. Equal volumes from these 10 specimens were pooled to provide the sample for analysis. No consistent variations in fluoride content with the time of the day the specimen was taken were observed; therefore, only mean fluoride values for each age category are given in this report. In the 11th collection, the specimens were obtained without regard for the time of day and were pooled for each age category to furnish four samples for analysis.

In the Grand Rapids survey, spot urine specimens were obtained from male school children aged 6 through 17 years. Approximately 15 spot specimens comprised each pool, and from 1 to 4 pools were analyzed for each age group. Continuous residents furnished the specimens for the last three collection periods. This survey, which was begun before the Montgomery County survey, did not parallel it in all details.

Fluoride Concentrations in Urine

The data on urinary fluoride concentrations for the Montgomery County residents are shown in table 2. Prior to fluoridation, the fluoride content of the specimens varied from 0.2 to 0.3 p.p.m. As early as 1 week after fluoridation, it was evident that the children were responding quite differently from the adults. At the end of 1 week, the adults' specimens contained 0.7 to 0.8 p.p.m. fluoride. At the end of 6 weeks, they contained the expected 1.0 p.p.m. fluoride (*10*). For these same periods, the fluoride concentration in the urine specimens from the children averaged about half these concentrations, and, although the children varied in age from 5 to 14 years, the fluoride content was essentially uniform for all. As shown by the data for succeeding sampling periods, about 3 years elapsed before the specimens of the children reached 0.9 to 1.1 p.p.m. fluoride.

In table 3, the ratio of urinary fluoride concentration to water fluoride concentration in Montgomery County for each collection period following fluoridation is shown. These ratios illustrate the particularly striking difference between the children and the adults during the first 2 years ($t=8.82$, $P < 0.01$). Equilibrium was reached by the adults after 1 week of fluoridation, whereas approximately 3 years was required for equilibrium to be reached by the children.

The data on urinary excretion of fluoride for the Grand Rapids residents are shown in table 4. The prefluoridation value of approximately 0.2 p.p.m. fluoride in the urine is consistent with the use of the original Grand Rapids water, which contained 0.1–0.2 p.p.m. fluoride. Approximately 2 months after fluoridation was started, the fluoride content of the urine had

Table 2. Fluoride concentration (p.p.m.) in urine specimens, Montgomery County, Md.[1]

Time after fluoridation	Date	Age, in years										
		5	6	7	8	12	13	14	Mean for 5–14	30–34	35–39	Mean for 30–39
0 week	Dec. 15–29, 1951	0.3	0.2	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.3
1 week	Jan. 3–5, 1952	.3	.3	.5	.4	.2	.3	.4	.3	.8	.7	.8
2 weeks	Jan. 9–11, 1952	.5	.5	.4	.5	.6	.6	.5	.5	.9	.9	.9
4 weeks	Jan. 23–25, 1952	.4	.4	.5	.6	.6	.6	.6	.5	.9	.9	.9
6 weeks	Feb. 7–11, 1952	.5	.5	.6	.6	.5	.5	.6	.5	1.0	1.0	1.0
10 weeks	Mar. 6–13, 1952	.5	.5	.6	.5	.7	.6	.5	.6	1.0	1.0	1.0
20 weeks	May 14–23, 1952	.7	.6	.5	.6	.6	.6	.7	.6	1.0	.8	.9
1 year, 17 weeks	Apr. 23–28, 1953	.8	.8	.8	.8	.8	.8	1.0	.8	1.2	1.2	1.2
1 year, 49 weeks	Dec. 2–4, 1953	.7	.7	.8	.7	.8	.8	.8	.8	1.1	1.1	1.1
2 years, 48 weeks	Nov. 29–30, 1954	1.1	1.0	1.0	1.1	.9	1.0	1.0	1.0	1.2	.9	1.1
3 years, 24 weeks	May 13–20, 1955	.9	.8	.9	.7	.9	1.0	1.0	.9	1.1	.9	1.0

[1] Fluoridation was begun Dec. 28, 1951.

Table 3. Ratio of urinary fluoride to water fluoride, Montgomery County, Md.

Time after fluoridation	Fluoride in water at tap (p.p.m.)	Urinary fluoride/water fluoride ratio, by age group	
		5–14	30–39
1 week	0.7	0.4	1.1
2 weeks	.8	.6	1.1
4 weeks	1.0	.5	.9
6 weeks	.9	.6	1.1
10 weeks	1.0	.6	1.0
20 weeks	1.0	.6	.9
1 year, 17 weeks	1.0	.8	1.2
1 year, 49 weeks	1.0	.8	1.1
2 years, 48 weeks	1.2	.8	.9
3 years, 24 weeks	.9	1.0	1.1

increased to 0.6 p.p.m. Approximately 5 years after the start of fluoridation, some of the school pupils were excreting 1.0 p.p.m. fluoride (ages 6, 7, and 17). In the final three collections in Grand Rapids (1952, 1954, and 1955), the excretion of fluoride averaged 1.0 p.p.m. for all age groups. The ratios of urinary fluoride to water fluoride would be the same as the mean urinary fluoride values, since the fluoride content of the water has been kept at a practically constant level of 1 p.p.m.

The 1948 survey in Aurora, Ill., provides the most recent data for that city. The fluoride content of urine specimens from boys aged 8 through 17 years varied from 0.8 to 1.0 p.p.m. and averaged 0.9 p.p.m. All age groups showed approximately the same fluoride concentrations. It remains speculative as to when these subjects arrived at this apparently stabilized relation between fluoride in the urine and fluoride occurring naturally in the drinking water. Similar data pertaining to the urinary excretion of fluoride in Aurora residents are presented elsewhere (*10*).

Discussion

Efficient elimination of fluoride by urinary excretion has been demonstrated in several clinical and experimental studies (*1*, *3*, *4*, *10–12*), and is now considered one of the main deterrents to the accumulation of a toxic amount of fluoride in the body tissues. It has been shown also that fluoride is eliminated with equal facility by persons drinking naturally fluoridated water (*1*, *10–12*) and by those drinking artificially fluoridated water (*3*, *4*).

The surveys in Montgomery County and Grand Rapids demonstrated a similar high level of efficiency in the urinary elimination of fluoride added to the drinking water as sodium fluosilicate or sodium fluoride. The findings confirm the results of previous studies, which showed that approximately 1.0 p.p.m. fluoride is found in the urine when fluoride is ingested in drinking water containing 1.0 p.p.m. from natural sources (*10*) or added as sodium fluoride (*3*, *4*). The findings are regarded as evidence that no hazard of cumulative toxic fluorosis is associated with the use of fluoridated water containing 1.0 p.p.m. fluoride.

An important consideration pertaining to water fluoridation is the time required for a stabilized equilibrium between water fluoride and urinary fluoride to be reached. That the period of adjustment can be remarkably short

Table 4. Fluoride concentration (p.p.m.) in urine specimens, Grand Rapids, Mich.[1]

Time after fluoridation	Date	Age, in years												
		6	7	8	9	10	11	12	13	14	15	16	17	Mean
0 weeks	Jan. 17–18, 1945	----	----	----	----	----	----	0.1	0.1	0.2	0.1	0.2	0.3	0.2
7 weeks	Mar. 6–8, 1945	0.6	0.6	0.5	0.7	0.8	0.6	.7	.7	.6	.6	.7	.7	.6
3 years, 18 weeks	May 20–21, 1948	.7	.8	.6	.7	.6	.7	.6	.7	.7	.8	.8	.7	.7
3 years, 43 weeks	Nov. 15–17, 1948	----	----	.7	----	.8	----	.8	----	.8	----	.7	----	.8
4 years, 43 weeks	Nov. 15–17, 1949	1.0	1.0	.6	.6	.8	----	.8	----	.6	.6	.6	1.0	.8
7 years, 37 weeks	Sept. 30–Oct. 7, 1952	.8	1.0	.8	.9	.8	1.0	1.3	.9	.9	1.1	.9	1.1	1.0
9 years, 17 weeks	May 13–14, 1954	1.0	.8	.8	1.0	1.0	1.0	.8	.7	1.0	1.0	.8	.9	.9
10 years, 19 weeks	May 25–26, 1955	.9	.9	.9	.8	1.0	1.0	1.1	1.1	.9	.9	.9	1.0	1.0

[1] Fluoridation was begun Jan. 25, 1945.

is clearly shown by the data for the adults in Montgomery County. As early as 1 week after fluoridation, the fluoride concentration of the urine was approximately that of the drinking water.

There is some indication that the period of adjustment was somewhat shorter for the children of Montgomery County than for those of Grand Rapids. The suggested difference in the two areas cannot reasonably be ascribed to a difference in the fluoridating agents, as it has been shown in studies with the white rat that sodium fluoride and sodium fluosilicate have similar metabolic effects (*13*, *14*). It is possible that the variation in sampling procedures was at least partly responsible for the seeming difference. It is also possible that the difference was due partly to the quantity of water ingested. Water consumption, and thus total fluoride ingested, may have been higher in Montgomery County, owing to the consistently higher mean monthly temperature in that area than in Grand Rapids. The temperature difference averages about 10 degrees throughout the year, according to information from the United States Weather Bureau. It is significant that in both Montgomery County and Grand Rapids the children reached the same state of apparently stabilized equilibrium between urinary fluoride concentration and water fluoride concentration as the adults in Montgomery County, even though they required a somewhat longer period of time.

Speculation as to the reasons for the apparently different response of the children and the adults must turn largely to the possibility of basic differences in fluoride metabolism reflected in the skeletal retention of fluoride. The rapid attainment of equilibrium in adults suggests certain limitations in the capacity of mature bone to deposit fluoride. In this connection it may be noted that the mature rat, without prior exposure to fluoride, stored considerably less fluoride in bones and teeth than did the young growing rat, although they ingested equal amounts of fluoride in their drinking water (*15*). Decreasing amounts of fluoride were stored by rats as the rate of growth diminished, and at maturity a relatively constant level of skeletal fluoride was attained. On the basis of these experimental data, it would seem reasonable for adults to excrete more fluoride than children and hence reach an apparent equilibrium between the concentration of urinary fluoride and water fluoride at an earlier date. The data of the present study thus lend support to the proposition that the retention of fluoride by bone is influenced by its state of maturity.

The length of time required for the children to reach a relatively constant concentration of urinary fluoride suggests some elevation in the fluoride deposited in the skeletal tissues during this adjustment period. However, this increase in retained fluoride would seem to be very small. The urine during the adjustment period contained 0.5–0.6 p.p.m. fluoride, providing for the elimination of substantial quantities of the waterborne fluoride. It has been shown that no adverse effects on the growth and development of the carpal bones accompany the continuous use of natural fluoride drinking water containing approximately 3.0 p.p.m. or more of fluoride (*16*). In addition, examinations of children after 10 years of use of a water supply containing 1.2 p.p.m. fluoride added as sodium fluoride failed to reveal anything unusual with respect to the blood, urine, height, or weight; and roentgenographic studies on the hand, wrist, knees, and lumbar spine of these children showed normal development (*17*). These observations support the conclusion that whatever this increase in the retention of skeletal fluoride by these younger age groups may have been, it was not a health hazard.

Summary

The concentration of fluoride in the urine was determined in individuals of different ages who were drinking water fluoridated to approximately 1.0 p.p.m. fluoride with sodium fluosilicate (Montgomery County, Md.) or with sodium fluoride (Grand Rapids, Mich.).

In adults (Montgomery County), the water fluoride and urinary fluoride concentrations became approximately equal within 1 week after the introduction of the fluoridated water. In school children aged 5 through 14 years (Montgomery County) and 6 through 17 years (Grand Rapids), a considerably longer period of time (approximately 3 and 5 years respectively) elapsed before the concentration of

fluoride in the urine reached that in the drinking water.

The difference in the response of adults and children during the initial period of exposure to a fluoridated drinking water suggests that the maturity of human skeletal tissue influences its capacity to retain fluoride.

The results of the study do not suggest any essential difference in urinary elimination of fluoride ingested in naturally fluoridated drinking water and the elimination of fluoride ingested in drinking water fluoridated with either sodium fluoride or sodium fluosilicate.

The findings are regarded as evidence that no hazard of cumulative toxic fluorosis is associated with the use of a drinking water fluoridated to contain 1 p.p.m. fluoride.

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Last year's outbreaks of salmonellosis in Philadelphia reemphasize the need for vigilant health department supervision of food processing and distribution practices.

Smoked Fish as a Vehicle of Salmonellosis

By I. OLITZKY, Ph.D., A. M. PERRI, M.D., M.P.H., M. A. SHIFFMAN, D.V.M., M.P.H., and M. WERRIN, V.M.D.

DURING the 1955 Memorial Day weekend, May 28–30, there occurred in Philadelphia three outbreaks of gastroenteritis in which smoked fish was the vehicle for the transmission of *Salmonella* organisms. The events preceding and including the outbreaks have the elements of a classic picture of *Salmonella* food infection.

To those concerned with the public health aspects of food production, distribution, and consumption, it has long been apparent that delicatessen foods are always potential vehicles for bacterial intoxications and infections. The factors supporting this potential are: The foods are generally consumed without further cooking, and some processors and many distributors and consumers disregard their perishable nature.

More than a decade ago, Kleeman, Frant, and Abrahamson (*1*) reported in detail two outbreaks in New York City of food poisoning associated with smoked fish. These events led to changes in the New York City Code with respect to the production and distribution of smoked fish products (*2*). One of the outbreaks affected 47 persons in 18 families and resulted in 2 deaths. The investigation of the food plant where it occurred revealed the following epidemiological chain, quite similar to that observed in Philadelphia.

Fish in the plant were contaminated with *Salmonella typhimurium*, apparently conveyed by sewage in the washing, soaking, and brining vats.

The process of salting and smoking the fish was not drastic enough to destroy the pathogens.

The lack of refrigeration throughout the entire food distribution system provided almost ideal temperatures for bacterial growth.

All four authors are associated with the Philadelphia Department of Public Health, Dr. Olitzky as principal bacteriologist and assistant chief, public health laboratory section, and his colleagues as chiefs of their respective sections: Dr. Perri, communicable disease control; Dr. Shiffman, milk and food sanitation; and Dr. Werrin, veterinary public health.

Smoked Fish

The annual processing and consumption of smoked fish in the United States—of kippered salmon, smoked sablefish, smoked whitefish, smoked carp, lox, and similar products—amount to millions of pounds. Even with this volume, the methods of processing have not been touched by technological advances, partly because, perhaps, many of the processing plants are small businesses, family-owned.

In the past, smoking of foodstuffs was essentially a means of preservation. With modern methods of preservation based on low-temperature storage, there is less need for a heavy smoke. In effect, the light smokes now used are primarily for flavoring the fish.

There are many variations in the smoking process for different types of fish and other food products. One variation applies to the preparation of kippered salmon, one of the products implicated in the Philadelphia outbreaks.

Salmon are usually received in a frozen state and are thawed in tanks or in running water. After thawing, each fish is split and cut into approximately 1-pound pieces, which are then brined from one-half to 2½ hours in a salt solution having 90° to 95° salometer reading. The fish, after being dyed a uniform color with certified dye, are placed on small hooks on wire-bottomed trays. The fish are allowed to drain in the smokehouse racks for several hours and then are heat dried at 80° F. for 8 to 12 hours. To finish off the kippering process, the fire is built up with sawdust and wood chips or shavings to give a hot smoke for about 1 hour at 175° to 180° F. The kippered salmon are cooled by means of circulating air, and then they are wrapped by hand.

There is no question that fish processed in the manner described are perishable products, to be kept under constant refrigeration. The wrappers on the kippered salmon in the Philadelphia outbreaks were clearly printed with a notation that the product was perishable and was to be refrigerated, but we found that these instructions were generally disregarded by the retailers. We found also that whitefish and lox are distributed unwrapped.

The Philadelphia Outbreaks

The first outbreak of salmonellosis in Philadelphia, designated the W family outbreak, was reported as food poisoning to the communicable disease control section of the City of Philadelphia Department of Health on June 2, 1955. The mother in the family and her two children had symptoms of fever, abdominal pain and diarrhea at 6 a. m., Saturday, May 29. The family had eaten smoked whitefish, kippered salmon, bagels, and cream cheese at 6 p. m. the evening before, May 28. The father ate the food but did not become ill.

The two children were hospitalized for treatment by their family physician. Stool cultures performed at the hospital were reported as negative for enteric pathogens, but cultures performed at the public health laboratory on July 2 were positive for *Salmonella newport.*

On June 3 a sanitarian from the health department milk and food section visited the W family. Fortunately, some of the fish was still in the refrigerator, uneaten, and he took it to the laboratory for analysis. The finding of large numbers of *Salmonella* organisms in the fish alerted the department to expect reports of other cases of food poisoning since large quantities of smoked fish products are consumed on weekends.

The pertinent facts of the W family cases and of the other 2 Philadelphia outbreaks are given in table 1. The children and mother in the W family are listed here as cases 1, 2, and 3, and the father, who was not ill, as case 4.

The S family outbreak was the next. The mother, father, and 2 children in the family ate smoked whitefish at 10 a. m. on May 29. The 2-year-old child (case 5) became ill 47 hours after the meal and was treated at a local hospital where her illness was diagnosed as salmonellosis.

The other members of the family (cases 6, 7, and 8), although asymptomatic, were found on routine culturing to be excreting *S. newport.* The grandmother (case 9) of the children took care of the sick child, and, although she did not partake of the food, she became ill with fever and diarrhea on June 10. Cultures taken from her on June 16 were found to be positive for *S. newport.*

The third and largest outbreak occurred as the result of a buffet supper, attended by some 30 persons, on May 29 at 6 p. m. Immediate steps were taken June 5 to study the outbreak after an alert practitioner telephoned the department that he was treating four patients who had symptoms of food poisoning.

Most of our information about the supper was obtained at the home where it was served. The foods consumed were smoked whitefish, lox, tunafish, salmon salad, potato salad, hard-boiled

Table 1. Cases of salmonellosis in the Philadelphia outbreaks, 1955

Case	Sex	Age	Incubation period (hours)	Dates of positive stool cultures	
				First	Last
	W family: Food eaten May 28, 6 p. m.				
1	Male	6	12	July 2	July 2
2	Female	3	12	do	Do.
3	do	29	12	[1]	
4	Male	32	[2]	[1]	
	S family: Food eaten May 29, 10 a. m.				
5	Female	2	47	Sept. 9	Sept. 9
6	do	30	[2]	June 10	July 14
7	Male	36	[2]	do	June 10
8	do	7	[2]	June 16	July 14
9 [3]	Female	55	?	do	June 16
	Buffet supper: Food eaten May 29, 6 p. m.				
10	Female	37	9	July 1	July 15
11	Male	50	[2]	[4]	[4]
12	do	30	12	June 15	June 15
13	Female	25	[2]	do	Do.
14	Male	32	24	June 9	June 9
15	do	5	24	do	Aug. 1
16	do	53	20	[1]	
17	Female	49	20	[1]	
18	Male	32	24	July 1	July 1
19	Female	26	24	[4]	[4]
20	Male	58	24	[4]	[4]
21	Female	46	39	June 14	June 14
22	Male	46	89	June 8	June 8
	Carrier: Food source unknown				
23 [5]	Female	30	?	June 10	June 10

[1] No cultures made. [2] No illness. [3] Grandmother who took care of grandchild (case 5) became ill on June 10. [4] No positives. [5] Carrier found at plant A was ill on May 6.

eggs, blintzes, sour cream, noodle pudding, and ginger ale. The smoked fish products were eaten by 13 people. Eleven of them became ill.

The case histories revealed that the incubation periods ranged from 9 hours to 89 hours with a mean of 26 hours.

Case 10 became ill on May 30 at 3 a. m. and had severe abdominal cramps, vomiting, and diarrhea. Case 12 became ill at 6 a. m. and had similar symptoms and chills as well. Case 13, wife of case 12, ate some of the food but was not ill. Case 11, husband of case 10, also remained asymptomatic after partaking of the food.

Eight persons, cases 14–21, became ill 24 hours after the supper. All 8 had symptoms of severe diarrhea and abdominal pain, and 1, the hostess (case 21), was hospitalized. Case 22 became ill 89 hours after the meal. He had chills, slight fever, and abdominal pain.

A stool culture taken from the hostess on June 14 was positive for *S. newport*. The organism was isolated also from the feces of 6 others and from 1 of the 2 asymptomatic individuals.

Food Processors and Retail Outlets

The health department started its sanitation investigation after receiving routine notification of the outbreaks in which smoked fish was the apparent vehicle. Calls at the affected households established where the fish products had been bought in each instance.

The kippered salmon eaten by the S family came from the J delicatessen, where sanitary conditions were found to be relatively good. The variety of smoked fish eaten by the W family was purchased at the G delicatessen, which had a refrigerated showcase in need of cleaning. The smoked fish products, however, were not stored in the showcase of the G delicatessen but were kept on top of the counter. The internal temperature of smoked whitefish tested at the store by our sanitarian was found to be 70° F. Presumably, the fish would stay on the counter until sold or otherwise disposed of and would remain at room temperature all the time.

The smoked whitefish eaten at the buffet supper had been purchased at the F delicatessen. There, too, the smoked fish were kept on a counter, fully exposed and unrefrigerated. The internal temperature of a sample smoked fish was 63° F. The fish were kept out all day at room temperature, and at closing time they were placed in a walk-in refrigerator, where the temperature was 36° F. There was some evidence of rodents in the storeroom although general sanitary conditions in the delicatessen were good.

Smoked fish are transported from the processor to the delicatessen in a refrigerated truck

where the temperature is maintained at about 40° F. One truck from processing plant A served the area containing the three retail outlets investigated. Since the sale of smoked fish products is heavy on weekends, and delivery of the fish usually precedes the weekend, it is quite possible that orders for all three stores came from the same shipment, but we could not ascertain that as a fact.

The processors said that they instruct the delicatessens about the need for refrigerating smoked fish because of its perishability. Nevertheless, many of the delicatessens fail to keep the products under refrigeration, and, since the stores may be open until the early hours of the morning, the fish are likely to remain at room temperature for a long time.

The Processing Plants

Each of the 3 retail outlets was served by the 2 food processors in Philadelphia who prepare smoked fish of the variety considered here. The A plant is located near the dock area on the Delaware River, where the buildings are old and where the original city was founded. Some attempts to improve the old building occupied by the A plant had been made. The floor was in fairly good condition in the room where the fish are thawed, washed, cut, brined, and wrapped. The walls had been recently tiled, and stainless steel tables had been provided for cleaning the fish and for the final wrapping. Housekeeping was poor. Boxes, odd containers, and miscellaneous objects and racks had accumulated on the floor and under tables. The windows were not effectively screened, and a dead mouse was found in the storeroom.

Most germane to the outbreaks was the condition of the toilet rooms and the handwashing facilities. The toilet rooms used by emp'oyees in the processing and wrapping operations were remote. The water closets were barely operative. The basin for handwashing was not provided with hot water. The cold water barely flowed. No sanitary towels or soap were available. The entire toilet premises were encrusted with a long-standing accumulation of dirt.

Conditions were generally good in plant B, which is housed in a relatively modern building. Even there, however, a handwashing basin adjacent to one toilet room did not have flowing water because of inadequate supply lines. When large quantities of water were used elsewhere in the plant, water would not run out of the faucets in the wash basins.

During the first inspection of processing plant A, samples of water from the soaking tanks, samples of brine from the salting tanks, and samples of freshly processed fish ready to be sent to the retail outlets were collected and taken to the laboratory for bacteriological analysis, shown in tables 2 and 3. The results of the analysis of water and brine from the plant are in line with the insanitary conditions there.

Table 2. Bacteriological findings in water and brine from plant A

Bacteria	Water		Brine
	Tank 1 [1]	Tank 2 [2]	
Coliforms (MPN/100 ml.)	9, 300	2, 100	110, 000
Escherichia coli (MPN/100 ml.)	700	400	15, 000
Enterococci (MPN/100 ml.)	930	90	230
Bacterial count (plate) per ml	14, 000	1, 500	16, 000

[1] Tank used to wash fish. [2] Tank used to soak and store salmon filets.

Table 3. Bacteriological findings in smoked fish from plant A

Bacteria	Kippered salmon	Smoked whitefish
Bacterial count (plate) per gram [1]	900	1, 580, 000
Staphylococci (coagulase-positive) per gram [2]	0	31, 000
Enterococci (MPN/gm.) [3]	0	0
Salmonellae	0	0

[1] Plate count agar (Difco). [2] Salt agar similar to mannitol salt agar (Difco). [3] SF medium (Difco).

It is of interest to compare the bacteriological findings of the fish samples from the A plant with the findings for the fish obtained from the W household, in tables 3 and 4. It is readily apparent, particularly with respect to the kippered salmon, that the bacterial population increased tremendously by the time the fish reached the consumer.

Table 4. Bacteriological findings in smoked fish from W family outbreak [1]

Bacteria	Kippered salmon	Lox	Smoked whitefish
Bacterial count (plate) per gram	1.3×10^{9}	20×10^{6}	180×10^{6}
Staphylococci (coagulase-positive) per gram	26×10^{6}	6.5×10^{6}	6×10^{6}
Enterococci (MPN/gm.)	11×10^{6}	11×10^{6}	11×10^{6}
Salmonella newport	Present	Present	Present

[1] Culture media the same as listed in table 3.

Source of Salmonella Organisms

At the same time plants A and B were being subjected to sanitary inspection, a medical officer from the communicable disease control section of the health department visited both processing plants and arranged to collect fecal samples from all employees. He examined approximately 70 employees and found one, an employee in plant A, to be excreting *S. newport*. Finding of the salmonella carrier was reported by the laboratory on June 13, 11 days after the first cases were reported to the health department.

The carrier (case 23), a woman aged 30, gave a history of illness beginning May 6, 1955, 3 weeks before the outbreaks. She had fever, abdominal pain, and vomiting, and was treated in the outpatient department of a local hospital. The hospital, however, made no effort to take cultures or to diagnose the illness of the patient, who continued to work at the processing plant until she was discovered to be a carrier. In this particular instance, the failure of the hospital to take a culture from a patient with an obvious gastrointestinal complaint had serious consequences.

Upon questioning, the owners of plant A denied that the carrier handled, wrapped, or packed smoked fish, but the carrier, when questioned, stated that she wrapped and packed smoked fish 7 out of 8 hours a day.

Discussion and Conclusions

Improved bacteriological techniques and more conscientious reporting of cases by hospitals and practitioners than in the recent past are the main factors behind the apparent increase in outbreaks of salmonellosis in Philadelphia as well as throughout the rest of the country. Salmonellosis was made reportable in Philadelphia in 1944 and in the State of Pennsylvania in 1952. Typhoid and paratyphoid A and B infections have been reportable to the Pennsylvania State Health Department since 1861.

To this day, however, many outbreaks of salmonellosis in family groups are not reported. Because of the long incubation period perhaps, the family gives no thought to the probability that the illness may be due to a food infection. Many persons have been made conscious, and erroneously so, of virus infections. As a result, illness caused by *Salmonella*, which has a short course, may be mistaken for the so-called epidemic nausea, diarrhea, and vomiting of virus origin. Because of failure to perform laboratory studies, many cases of salmonellosis may go undiagnosed even though the sick are treated by physicians. There is no question, however, that practicing physicians have become increasingly aware that gastroenteritis may be due to *Salmonella* infections rather than to other causes.

Epidemiological investigations of food poisoning or food infection outbreaks often are frustrating experiences. Although the elements in the chain of events can be visualized and theorized, it is impossible in many instances to obtain solid laboratory proof to support the theory. Frequently, the suspected food is not available for analysis, or the source of the etiological agent, the carrier, cannot be found.

We were fortunate that the suspect food from one of the outbreaks was available to us and that analysis revealed the causative organism. Thanks to the cooperation of many physicians treating the victims, fecal specimens could be examined. We were able to find a carrier in one of the food-processing plants. The lack of washroom facilities in the plant was conducive to the establishment of the anal-oral route of infection. There was almost complete lack of refrigeration of the fish products in the local retail outlets. Thus, all the elements necessary to close the epidemiological investigation were present.

Salmonella newport

S. newport is the second most prevalent *Salmonella* type found in food infection outbreaks. *S. typhimurium* heads the list. *S. newport* is widely distributed in the United States. In studying 310 cultures of *S. newport* during the period 1934–47, Edwards, Bruner, and Moran (*3*) found that 220 cultures were isolated from cases of gasteroenteritis. A Public Health Service report (*4*) on food poisoning outbreaks in 1954 indicates that *S. newport* was often implicated in the 1,090 cases representing 22 outbreaks associated with food during that year.

S. newport itself would seem to be one of the more potent inciters of gastroenteritis in the *Salmonella* group. The carefully controlled feeding experiments reported by McCullough and Eisele (*5*) revealed that, of the *Salmonella* types used, *S. bareilly* and *S. newport* could produce illness with small dosage levels. One of the subjects became ill after ingesting 152,000 *S. newport* organisms. Although we do not know the number of organisms introduced to foods by the feces-contaminated hands of carriers, it is readily apparent in our study that the lack of refrigeration in the retail outlets did result in more than enough organisms to produce symptoms of gastroenteritis.

Salmonella Carriers

A convalescent carrier was the source of the etiological agent in the Philadelphia outbreaks. We do not know at this time what percentage, if any, of the others in the outbreaks will become chronic carriers.

The chronic carrier state in humans is rarely observed with salmonellae other than *Salmonella typhi*. Recent experiences indicate that the convalescent carrier state may last longer than was generally assumed. Every person reported as a case in the outbreaks and as having had a positive culture is being considered as a convalescent carrier, and cultures are taken as follows:

The first, second, and third stool cultures are taken at least 5 days apart, beginning after the 14th day of the last dose of any antibiotic or chemotherapeutic agent. If the first 3 cultures are negative, the fourth culture will be taken 1 month after the third culture. If any of the first 3 cultures are found to be positive, the person will be referred for further treatment. The fifth and sixth cultures will be taken a month apart, and the seventh culture will be taken at the end of the sixth month—again provided that the cultures are negative. If cultures taken from anyone from the fourth month on are positive, then the individual will be considered a chronic carrier of salmonellae and will be placed on a list of chronic carriers.

The results of the followup stool cultures on the cases to date of this report are shown in the last column in table 1. *S. newport* was found in the feces of some of the victims 2 to 3½ months after the outbreaks.

Lessons To Be Learned

Although the cases we report here are new, the lessons to be learned are old, but they are repeated again for the educational value attributed to repetition. We are aware that even the most rigid food-handler examination program is not perfect in detecting carriers of bacterial enteric pathogens. It is possible for a food handler to become a carrier soon after the annual or semi-annual fecal examination. Thus, in addition to legislation, the importance of educating management and workers in the food industry to the prime requirement of providing and using adequate washroom facilities is paramount.

The failure of retail outlets to refrigerate items that are highly perishable and that are consumed without further cooking cannot be condoned. It is quite apparent that health departments must exercise constant surveillance of local food processors, distributors, and retailers in order to enforce the refrigeration requirements of perishable foods.

The public must be educated to the fact that light smokes and salts used in present day smoked fish processing are not in themselves sufficient for the safe preservation of fish products.

Summary

We have described three outbreaks in Philadelphia in 1955 of salmonellosis in which smoked fish products served as vehicle for the transmission of *Salmonella newport* from carrier to susceptible consumer. Eleven adults

and 4 children were made ill directly by consumption of the food, and 1 adult was made ill through secondary infection. The chain of events leading up to these outbreaks was:

The failure of a hospital clinic to culture a stool specimen from a patient with gastrointestinal symptoms.

The failure of a food processing plant to provide adequate sanitary facilities for its personnel.

The failure of retail outlets to refrigerate a highly perishable food item.

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Surgeon General Scheele Resigns

Effective August 2, 1956, Dr. Leonard A. Scheele resigned as Surgeon General of the Public Health Service to become president of Warner-Chilcott Laboratories.

Marion B. Folsom, Secretary of Health, Education, and Welfare, commented that Dr. Scheele's "imagination, skill, and resourcefulness" have played "a particularly significant role in the development of many new and expanded programs which have notably advanced the health of the American people."

Commissioned in the Regular Corps of the Public Health Service in 1934, Dr. Scheele gave 22 productive years to Government service, including 4 years in the armed services. He was appointed director of the National Cancer Institute in 1947 and was appointed Surgeon General in 1948.

The Use of a Series of TV Programs to Educate Parents in Child Care

By ANNE B. WAGNER, M.D., M.P.H., and MARY ELLEN PATNO, Ph.D.

SOON after the establishment in Pittsburgh, Pa., of the country's first community sponsored educational television station, WQED, its management requested the Pittsburgh Department of Public Health to cooperate in the presentation of a series of programs on child care. This article describes the content of the series and the results of a survey which was conducted among mothers with young children.

The series was entitled "At Home With Your Child." It included 13 half-hour programs, presented weekly during the first 3 months of 1955. The programs consisted of an exposition of normal physical and emotional growth from birth through the fifth year of life. More fully stated, each program attempted to describe and demonstrate how normal babies and children look and act at each key stage of development, what their needs are, and ways of meeting these needs.

In all but three of the programs, infants and young children were used on the set to illustrate points of discussion. Children who participated were selected with a view to demonstrating the wide variation in size and motor abilities at each age level. The youngest infants were completely undressed in order to demonstrate physical appearance. Older babies, up to the age of 2 years, were stripped except for diapers. Children beyond 2 years of age were dressed in sunsuits because their emerging sense of modesty might otherwise have provoked unnatural behavior.

None of the subjects displayed uncontrollable crying or other refractory behavior which would have necessitated their removal from the studio. Fears that the lights and cameras might produce apprehension and stilted reactions proved groundless. After a cursory inspection of the studio and cameras, the youngsters devoted themselves to playing with the toys provided, and none of the subjects, from the tiniest, 10 days of age, through the 6-year-olds, paid the least attention to the lights.

The following material outlines the program titles, the various casts, and the material covered. The physician who served as narrator was the only person who appeared on every program.

1. *Preparing the Home for the Baby*

The physician and a public health nurse described, and demonstrated where possible, the nursery and its furnishings, heating in the

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Kinescopes of the programs discussed in the article are available from the National Educational Television Center, Ann Arbor, Mich.

home, refrigeration, and the health of the family as a whole and its influence on the new baby.

2. *The New Baby Comes Home*

With the use of a doll model, the physician and a public health nurse discussed and demonstrated a typical layette. The physician then pointed out the physical characteristics of a newborn and of a 6-week-old baby and discussed the kind of behavior to be expected through the first 6 weeks of life.

3. *Baby Gets a Bath*

The physician discussed the skin and its care. The nurse then bathed a 2-month-old baby. In preparation for this program, the nurse bathed the infant several times in his home so that she and the baby would be accustomed to each other.

4. *Feeding and Formula Making*

Breast and bottle feeding and the need for vitamin supplements were discussed by the physician. A public health nurse then demonstrated the terminal heating method of formula preparation.

5. *Mother's Night Out*

The physician discussed and demonstrated the physical and behavioral characteristics of a 3-month-old child. Then, while the physician spoke of the "introduction of solid foods," the mother demonstrated how to feed a baby with a spoon. The second half of the program dealt with the mother's need for recreation, how to choose a baby sitter, and what the baby sitter should know.

6. *Baby Visits His Doctor*

This program opened with the physician telling of the need for regular medical supervision of the well infant. A pediatrician, a mother, and her 4-month-old baby then demonstrated a typical well-baby visit to the doctor. Emphasis was placed on the importance of regular health supervision, immunization, anticipatory guidance, and a permissive atmosphere in which the mother feels free to raise questions and discuss her problems. The mother had been attending the child health conference in which the pediatrician worked. Therefore, she was quite at ease before the cameras and brought up for discussion traditional beliefs in child care held by older mothers in her subculture. Also, the second diphtheria-pertussis-tetanus inoculation was given on the program.

7. *Baby Graduates to the High Chair*

The physician opened the program with a discussion of the physical, motor, and emotional characteristics of the average 6-month-old infant, demonstrating her points with two 6-month-old babies. One child was then placed in a high chair and was offered milk from a glass while the physician talked about weaning, learning to drink from a cup or glass, teething, and thumbsucking. Later, the physician discussed and demonstrated, by offering toys to the babies, safe and suitable toys.

8. *Baby Starts to Crawl*

This program began with one 9-month-old baby seated in a playpen while the physician talked about the characteristics of this age group. Fraternal twins were then introduced, and the physician and mother discussed the special problems of a mother with twins. The three babies were permitted to demonstrate their own modes of crawling in free play on the nursery floor, while the physician suggested how the home can be made safe for the creeping baby.

9. *Baby's First Step*

Using three 1-year-old babies as models, the physician demonstrated and discussed the physical characteristics and motor abilities of that age group, with special emphasis on normal variations, proper weight-bearing on the feet, and the importance of well-fitted shoes. The children were then permitted to play on the nursery set as the physician talked about the changes in eating habits and other behavior patterns to be expected in the age group.

10. *Toddlers*

While the physician talked about growth and development in children between the first and third years, three children, 2–3 years old, were permitted free play on the set. Mothers intervened only to settle altercations over possession

of a toy. Midway in the program the children were seated at a small table and served fruit juice and crackers, while the physician demonstrated and discussed development of handedness and coordination, parallel play, and vocabulary development. The children returned to their play activities and the physician concluded with a discussion of toilet training.

11. *Community Help for Families*

The physician interviewed representatives of a public health nursing agency, of a family and children's social service agency, and of the local chapter of the American Red Cross to bring out what services each organization offered and how requests for service are made. Since this program was not considered germane to a growth and development series, it was omitted from a subsequent series.

12. *Playmates*

Three children, aged 4–5, were permitted to examine play materials provided on the set while the physician discussed physical and emotional characteristics at this age. A nursery-school teacher then led the children in a demonstration of cooperative play. During the latter part of the program, the physician talked about the control of communicable disease in the preschool child.

13. *Getting the Child Ready for School*

This final program opened with the physician pointing out the importance of careful physical evaluation of the child about to enter school. Using two 6-year-old children as models, the physician demonstrated a vision screening test for a child of this age and the audiologist demonstrated use of the pure-tone audiometer in a screening test for hearing. The audio-engineer put on the air notes of approximately the same frequencies used in the test. The program ended with a discussion by the physician of emotional preparation of the child for school and the value of a preenrollment visit to school.

Since "At Home With Your Child" was the first program of its kind in Pittsburgh, both of its sponsors were interested in assessing the size and reactions of the audience. Both organizations preferred a survey which represented all mothers of preschool children in the Pittsburgh metropolitan area. This was not feasible. It was possible, however, to carry out a mail survey limited to recent mothers in the city of Pittsburgh.

The names and addresses of women who were queried were obtained from a sample of the live-birth certificates for the 12 months preceding the close of the series. The sample was obtained by first selecting all certificates with file numbers ending in the digits 2 or 7. Certificates for extramarital children and those who died in infancy were then excluded and questionnaires were sent by mail to the mothers of the remainder.

Followup of nonrespondents consisted of a reminder which was sent 7 to 10 days after the original questionnaire, described below, and a second questionnaire which was mailed 2 to 3 weeks after the original. Further followup by mail, the only type of followup feasible, was

not attempted for two reasons. First, there was a 70-percent response which was considered sufficient to satisfy purposes of the survey. Second, it was felt that further mail inquiry might result in criticism of the health department or the television station.

The questionnaire asked whether the family owned a television set, whether the mother saw any of the programs, and, if so, which of the programs she found helpful. All other data, such as those concerning race of mother, age of mother, size of family, and place of residence, were obtained from the birth certificate. In this report only the race, age of mother, and size of family are considered. The age groups used are: under 20 years, 20–29 years, and 30 and over. Family sizes have been described according to the number of children, namely: 1 child, 2 or 3 children, 4 or more children.

The sample included 2,476 mothers. Of these, 141 or 5.7 percent could not be reached through the mail. In these cases, the original questionnaire was returned by the post office with the notation that the person was not known at the address or that the person had moved and had left no forwarding address.

As in most surveys of this kind, the relative number of persons not reached through the mail was greater for the nonwhite. While 4.8 percent of the letters to white mothers were returned by the post office, 10.1 percent of the letters to nonwhite mothers were not delivered. The number of questionnaires not delivered also varied with the age of the mother and the size of the family. For example, the proportion of white mothers not reached decreased as the age of the mother increased or as the size of the family increased. In other words, within a given age group, the proportion of questionnaires delivered increased as there were more children in the family; and, for given family sizes, the proportion increased as the age of the mother increased. Among the nonwhite mothers, a slightly different pattern was observed. As with white mothers, the number not reached by mail decreased as the age of the mother increased; but, unlike the white, the number of nonwhite mothers who did not receive the questionnaire increased as the size of family increased.

Women who presumably received the questionnaire numbered 2,335. Of these, 1,646 or slightly more than 70 percent responded. White mothers responded better than nonwhite mothers, older mothers better than young mothers, and women with 2 or 3 children better than those with only 1 child or with 4 or more children (table 1). Since only 20 percent of the respondents reported they had watched the series, the response was remarkably high. Three factors may have contributed to the good response. First, the Pittsburgh area has not been subjected to many surveys of this type, and so residents may still be tolerant of mail questionnaires. Second, it is logical that recent mothers would have a strong interest in the subject of child care. And third, pamphlets on child care were offered to respondents.

One of our interests was in determining the size of the potential audience, that is, the number of families who owned television sets. At least 61 percent and possibly as many as 91 per-

Table 1. Response by race, age of mother, and number of children in family

Size of family	White				Nonwhite			
	All ages	Under 20	20 to 29	30 and over	All ages	Under 20	20 to 29	30 and over
All sizes								
Number contacted	1,963	112	1,172	679	372	44	225	103
Number responded	1,422	60	860	502	224	25	135	64
Percent response	72.4	53.6	73.4	73.9	60.2	56.8	60.0	62.1
One child								
Number contacted	581	91	421	69	80	28	41	11
Number responded	417	50	314	53	46	16	25	5
Percent response	71.8	54.9	74.6	76.8	57.5	57.1	61.0	45.5
Two or three children								
Number contacted	1,018	21	663	334	159	16	108	35
Number responded	755	10	490	255	99	9	65	25
Percent response	74.2	47.6	73.9	76.3	62.3	56.2	60.2	71.4
Four or more children								
Number contacted	364	----	88	276	133	----	76	57
Number responded	250	----	56	194	79	----	45	34
Percent response	68.7	----	63.6	70.3	59.4	----	59.2	59.7

cent of all families with a child under 1 year of age had sets. The former figure was obtained under the assumption that all nonrespondents were without sets; the latter, under the assumption that all nonrespondents had sets. Among respondents, 86.6 percent, 1,426 of 1,646, owned sets.

There is little doubt that nonwhite families owned proportionately fewer sets than did white families. For example, while 89 percent of the white respondents owned sets, only 69 percent of the nonwhite respondents said that the family had a set. Also, when all persons who did not respond were considered as having television sets, no more than 81 percent of the nonwhite families could have owned sets compared with 92 percent of the white families.

One of the major objectives of the survey was an estimate of the number of women with infants who saw one or more of the programs. Since the sample used in the survey represented one-fifth of the recent mothers in Pittsburgh, such an estimate can be easily obtained by simply multiplying the number of known viewers, 330, by the factor 5 for a result of 1,650. This, however, must be considered a minimal estimate. It is possible that some of the nonrespondents saw the programs. The largest unknown audience, however, was undoubtedly among mothers in the areas immediately surrounding Pittsburgh, where there are even more births than in the city proper. It is reasonable to assume that the programs were viewed also by others than recent mothers.

The relative size of the audience and whether it varied with such factors as the age of the mother were also of interest. Because some mothers saw the telecasts in homes of relatives or friends even though they did not have television sets and because of the "problems of nonresponse," the relative size of audience was determined by relating the number of known viewers to the number of persons who presumably received the questionnaire (table 2).

In total, at least 14.1 percent of the mothers watched one or more of the programs. Proportionately, the nonwhite audience was as large as the white audience, in spite of a poorer nonwhite response and evidence that fewer nonwhite families had television sets in their homes. Among white families, as the age of the mother increased or as the size of the family increased, the relative audience size decreased. For example, at least 18.8 percent of the white mothers

under 20 were included in the audience as compared with 12.5 percent of the mothers over 30. The largest audience among the nonwhite mothers consisted of those in their third decade of life.

The initial series of "At Home With Your Child" was produced with very little publicity. A week before the programs began one newspaper carried a feature story in a Sunday supplement. Thereafter an occasional small advertisement was used. In the daily listings of programs, the time period was designated as "Ladies Only" since "At Home With Your Child" was 1 of 5 programs presented at that time of day throughout the week.

The questionnaire included an item which asked the mother if she would have watched had she known of the program. Among 903 women who replied that they had a television set, could receive the educational station, but had not known of the series, 90 percent, 810, said they would have watched had they known of the program. If one accepts their statements at face value and adds the number of known viewers, it means that the audience might have included as many as 49 percent, 1,140 of 2,335, of the recent mothers had the series been widely publicized.

Mothers were asked to specify the number of programs they saw and to indicate which ones they considered helpful. The 330 women who reported watching the telecasts stated they had seen 1,287 separate programs, an average of 3.9 programs per person. Mothers of only 1 child averaged 3.8 programs; of 2 or 3 children, 4.2 programs; and of 4 or more children, 3.4. Viewers also reported 78.2 percent of the programs seen as being helpful. Mothers with large families found as many programs helpful as did mothers of small families, but their interests were somewhat different. For example, while only 5.5 percent of the mothers with one infant selected "Getting the Child Ready for School" as helpful, 23.0 percent of the mothers with 4 or more children did so. The most popular programs among all mothers were "Baby Gets a Bath" and "Mother's Night Out."

For all family sizes, approximately 84 percent of the respondents requested the pamphlets offered. Mothers who owned television sets requested materials more often than those who did not, 85 percent to 79 percent. Among those with sets, mothers who saw the programs requested pamphlets more often than did those who did not watch, 95 percent to 82 percent. Although this difference suggests that the programs may have stimulated interest in educational materials, there is the possibility that whatever caused the mothers to watch the programs also caused them to request materials.

Table 2. Number of mothers who watched one or more programs

Number of children and age of mother	Number contacted			Watched one or more programs					
				Number			Percent		
	Total	White	Nonwhite	Total	White	Nonwhite	Total	White	Nonwhite
All families	2,335	1,963	372	330	278	52	14.1	14.2	14.0
Mothers under 20	156	112	44	26	21	5	16.7	18.8	11.4
20–29	1,397	1,172	225	208	172	36	14.9	14.7	16.0
30 and over	782	679	103	96	85	11	12.3	12.5	10.7
One child	661	581	80	109	95	14	16.5	16.4	17.5
Mothers under 20	119	91	28	20	17	3	16.8	18.7	10.7
20–29	462	421	41	79	70	9	17.1	16.6	22.0
30 and over	80	69	11	10	8	2	12.5	11.6	18.2
Two or three children	1,177	1,018	159	160	134	26	13.6	13.2	16.4
Mothers under 20	37	21	16	6	4	2	16.2	19.0	12.5
20–29	771	663	108	110	90	20	14.3	13.6	18.5
30 and over	369	334	35	44	40	4	11.9	11.9	11.4
Four or more children	497	364	133	61	49	12	12.3	13.5	9.0
Mothers 20–29	164	88	76	19	12	7	11.6	13.6	9.2
30 and over	333	276	57	42	37	5	12.6	13.4	8.8

In other words, they would have asked for the pamphlets without having seen the programs.

Discussion

Until recent years, education on child care offered by health departments was somewhat limited to that given in child health conference service and in the public health nurse home visit. For obvious reasons, these services are usually restricted to the low-income segment of the population and to families where intensive service is required. Within the last few years, however, it has become evident that many parents at the middle- and higher-income levels, using private physicians as their source of medical care and having some knowledge of child growth and development, welcome further information on child care, especially through mass media. The popularity of child care articles in newspapers and magazines is one indication of this kind of interest.

Television, the newest of the mass media of communication, differs from the others in several important ways. Although it is capable of reaching a large number of people at one time, it is also capable of stimulating an intensely personal reaction, second only to a face-to-face situation. It gives the viewer the illusion of being spoken to directly and hence a feeling of close personal contact. The combination of sound and sight, plus the availability in one's own home, contribute to the viewer's feeling of being part of what is being observed.

In the foregoing study of an audience which watched a series of television programs on child care there are indications that television reaches many families who do not receive medical or nursing care from the health department. The estimated television audience slightly exceeded the number of mothers with young babies who attended child health conferences during this same period. Also, the geographic distribution of viewers differed from that of families utilizing child health conference service. Of the mothers in the known television audience, 84 percent were white; but during the period the programs were telecast, only 50 percent of the mothers who attended child health conferences and 52 percent of the mothers with infants who were visited by public health nurses were white.

The economy of effort possible through the use of television when the goal is solely education is reflected by the fact that 1 physician and 1 nurse produced this series of programs. In order to provide well-child care for a slightly smaller number of children in the same age group, 499 sessions of child health conference were held during the same period of time, staffed by 1 physician and 2 or more public health nurses for each session.

Inasmuch as both the television station and the health department benefit by having as large an audience as possible, it seems logical that both agencies share in the publicity effort. Before the series was repeated in the fall of 1955, the department and the station combined efforts to publicize it as widely as possible throughout the Pittsburgh area. A feature story was carried by one of the large daily newspapers, in addition to the listing in the television section of each of the metropolitan newspapers. Flyers advertising the program were prepared and distributed to new mothers in the maternity divisions of hospitals, to PTA and other parent groups associated with the schools, to women's club groups, and to customers in infants' wear sections of local department stores. The Carnegie Library prepared an attractive leaflet containing a reading list on child care. The leaflets were placed near a poster advertising the program in all Carnegie branch libraries throughout the area.

When the series was telecast the second time, each program was recorded by kinescope, so that the films would be available not only for periodic daytime telecasting but also for showing at other times and to other groups. It is intended to telecast the films during the evening hours when working mothers and fathers are free to view them. The films are also being offered for use in teaching normal growth and development to medical students and nurses and as background material for parents' discussion groups.

For reasons as yet unknown, chemical treatment of privies with dieldrin, aldrin, BHC, and chlordane increases the breeding of Musca domestica, according to CDC studies at Savannah, Ga.

Fly Production in Treated and Untreated Privies

By JOHN W. KILPATRICK, M.S., and H. F. SCHOOF, Ph.D.

PRIOR to 1951 human excrement was not considered to be an important breeding medium for houseflies. However, since 1951 there has been considerable evidence of copious housefly breeding in human feces. Studies in the lower Rio Grande Valley, Tex. (*1*), and in Phoenix, Ariz., and Charleston, W. Va. (*2*), have indicated this intensive breeding to be associated principally with the use of dieldrin as a residual or as a larvicidal treatment in privies.

In 1953 the Technical Development Laboratories of the Communicable Disease Center, Public Health Service, undertook a long-range investigation in southeastern Georgia, near Savannah, to study this paradox of increased housefly production from treated privies. During 1953 the study of fly emergence from 100 untreated privies (10 in each of 10 areas) substantiated the pre-1951 observations that human excrement as a breeding medium normally contributed little to the overall housefly population (*3*). In 1954 the study plan was designed to determine what effect chemical treatment of privies with certain chlorinated hydrocarbon insecticides would exert upon housefly and other fly production.

Mr. Kilpatrick and Dr. Schoof are the co-authors of the article entitled "The Use of Insecticide Treated Cords for Housefly Control," in the February 1956 issue of Public Health Reports (p. 144). Dr. Schoof is chief of the Biology Section of the Technical Development Laboratories, Communicable Disease Center, Public Health Service, Savannah, Ga. Mr. Kilpatrick is an entomologist with the laboratories.

Assistance with the studies reported here was given at the laboratories by Dr. Harold R. Dodge, who identified the majority of the species in the lesser known dipterous groups and helped in processing the copious collections of Diptera, and by Fred Freeman and Bernard O. Smith, who helped in preparing the study structures and collecting the fly samples.

Procedure

In 1953 the study included the trapping of flies from 10 privies in each of 10 areas (*3*). In 1954 the same privies were used in studies as follows:

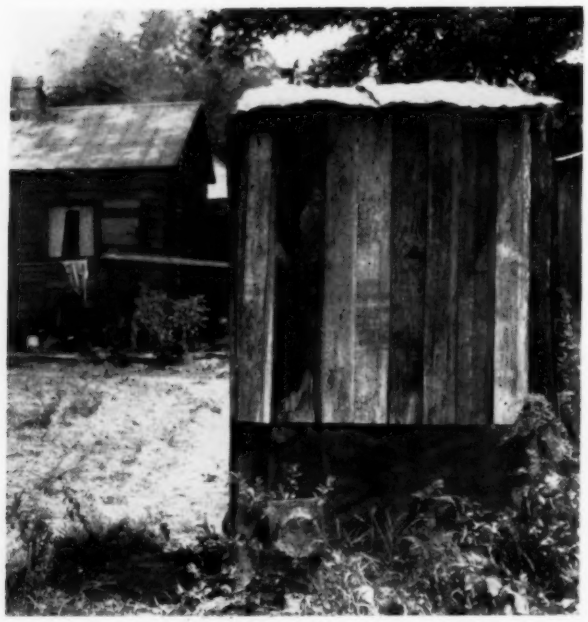
Series I (Dieldrin and DDT)

(*a*) Untreated control—20 privies (10 each in 2 areas).

(*b*) Overall DDT treatment at 200 milligrams per square foot (late March)—10 privies (1 area).

(*c*) Overall dieldrin treatment at 50 mg./sq. ft. (early April)—30 privies (10 each in 3 areas).

In series Ib and Ic, all animal pens and porches on the premises were treated, as well as the privies. Overall privy treatment included the pits and their contents.



Fly trap in place on privy in Georgia studies.

Series II (Dieldrin, Chlordane, BHC)

(*a*) 3 privies treated with dieldrin at 50 mg./sq. ft. (August).

(*b*) 3 privies treated with chlordane at 100 mg./sq. ft. (August).

(*c*) 3 privies treated with BHC (benzene hexachloride) at 40 mg./sq. ft. (August).

(*d*) 3 untreated control privies.

Treatment was restricted to the privy contents, riser walls (inside and outside), and the inside of the privy superstructure. All privies were within the same 3- to 4-block area.

Series III (Dieldrin)

Ten privies treated with dieldrin at 50 mg./sq. ft. (August). Treatment made to inside walls of structure and to pits and their contents.

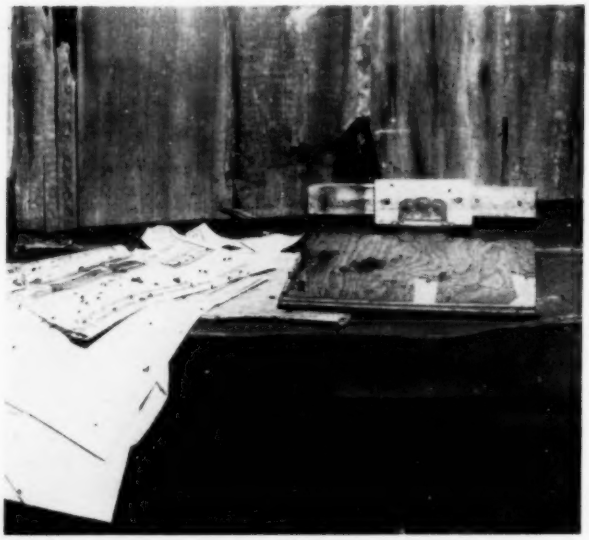
Series IV (Dieldrin and Aldrin)

(*a*) 3 privies treated (September) with dieldrin at 50 mg./sq. ft. Treatment restricted to the inside of the privy risers. Surfaces not treated were protected from spray drift by paper barriers.

(*b*) 3 privies treated (September) with dieldrin at 50 mg./sq. ft. Treatment was applied only to the excrement. Adjacent riser surfaces protected from spray drift by paper barriers.

(*c*) 4 privies treated (September) with aldrin at 50 mg./sq. ft. Treatment applied to the inside walls of the structures and to the pits and their contents.

In evaluating the effects of the dieldrin and DDT treatment (series I) on privy fly production, flies were trapped in 5 privies from each of the 6 areas over a 3-week period. At the end of the 3-week period, flies emerging from the alternate privies in the same area were trapped. During a trapping period each privy was sealed and made fly tight with the aid of new boards, building paper, masking tape and banked earth around the bottom edges of the building. Each riser was fitted with a seat-hole cover equipped with a spring hinge and lined with foam rubber to provide a close fit when installed over the opening. A hole 6 inches in diameter was cut in the outside wall of the privy approximately 12 inches above ground level on that side of the privy exposed to the



Interior of privy shows seat lid installed.

Closeup of fly trap on exterior of privy.

greatest amount of light. A cone-type trap, constructed of copper wire (36 x 40 mesh) was then attached over the hole. Sponge rubber affixed to the bottom of the plywood base of the trap assured a tight seal. At the end of each trapping cycle the privies were reopened to allow a resumption of fly breeding. (See photographs.)

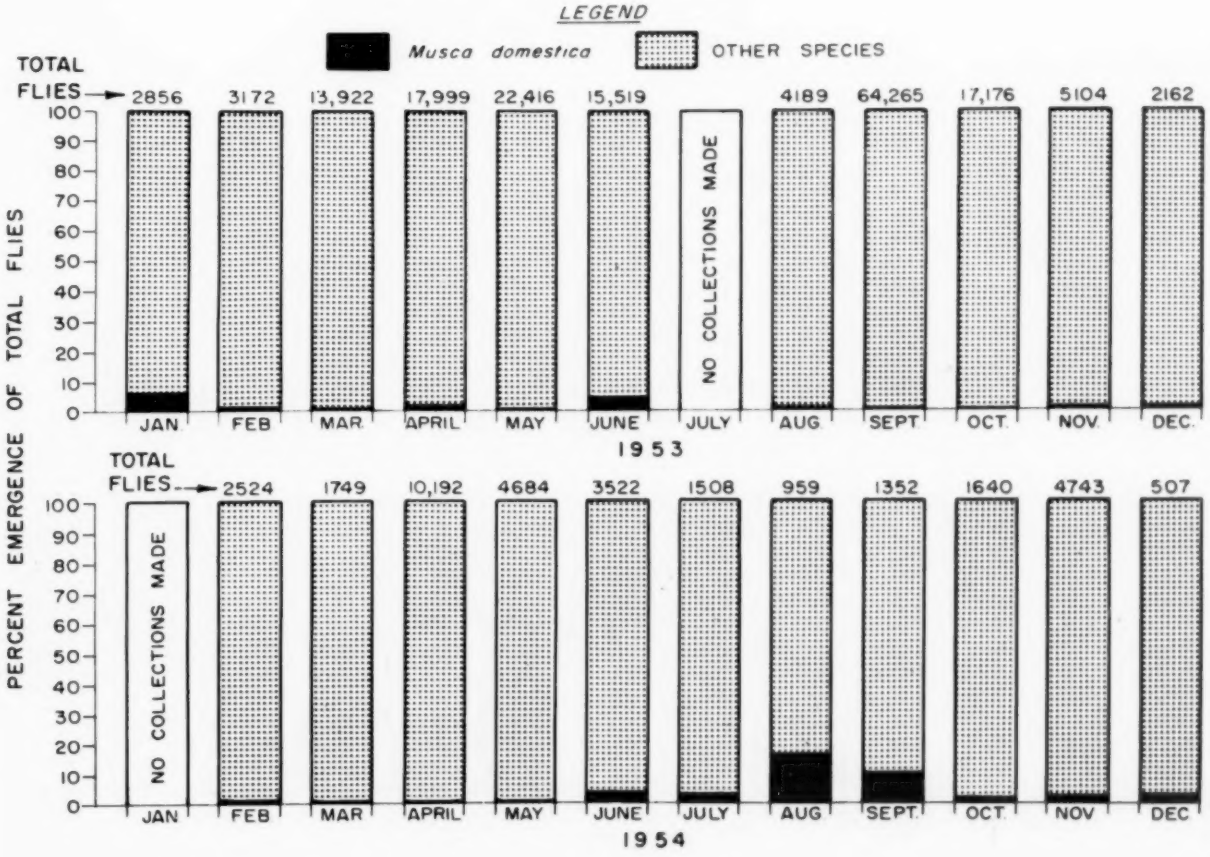
In privy studies involving only 3 or 4 privies for each type of treatment, the flies emerging from the privies were trapped for 3 weeks, and then the privies were allowed to remain open for the 3 succeeding weeks. Then another trapping cycle was begun.

To evaluate the possible effect of dieldrin resistance on housefly breeding potential in treated and untreated privies, one of the untreated areas was located between 2 treated zones (series Ia) approximately one-fourth mile from either zone. As a result, housefly populations from all 3 areas could intermingle readily. Pretreatment and post-treatment levels of dieldrin resistance in the fly populations of the various areas were measured. These determinations were made by collecting adult flies from the various areas, obtaining eggs from these flies and testing their progeny by 30-minute exposures to plywood panels treated with dieldrin at the rate of 25 mg./sq. ft. Mortality counts were made at 48 hours.

Untreated Privies (Series Ia)

In the untreated areas (fig. 1), the prevalence of *Musca domestica* was low throughout each entire 12-month period. The largest percentage emergence of *M. domestica* during any one month was 6.3 in 1953 and 16.9 in 1954. Considerable variations occurred from month to month in the total number of flies trapped. This fact can be partly explained by seasonal emergence of various species. *M. domestica*

Figure 1. Percent of Musca domestica and other flies emerging from untreated pit privies: 1953 (100 privies) and 1954 (20 privies).



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was not a major emerging species at any time, representing only 1.2 percent in 1953 and 2.2 percent in 1954. In regard to 1954, the total fly emergence during the month of highest percentage emergence (August) was the lowest in magnitude (959 specimens) during the April to October period. Thus, the pattern of housefly emergence from untreated privies is similar for both years.

DDT-Treated Privies (Series Ib)

The effect of DDT residual treatments on housefly emergence from privies is shown in figure 2. Although treatment occurred in March, no substantial change in *M. domestica* emergence was noted until July. During that month houseflies represented 29.5 percent of the 1,741 specimens collected. However, of the total of 514 houseflies trapped in the 5 privies during the period, 396 specimens were produced by 1 privy. Subsequent trappings from the privy failed to show a sustained increase in housefly production so that the apparent increase for a single privy in July appears to be incidental to the general pattern. In general the housefly emergence in the DDT-treated areas was comparable with that from untreated privies.

Dieldrin-Treated Privies (Series Ic)

The percentage emergence of *M. domestica* from dieldrin-treated privies is contrasted with other species in figure 3. Although the 3 dieldrin-treated areas received residual applications early in April, increases in the emergence of houseflies were noted in May. Continued increases of housefly production on both percentage and numerical bases also were evident during the ensuing months in all 3 areas. During August, 87.9 percent of the 20,538 flies trapped were *M. domestica*. Increased emergence was apparent for October, November, and

Figure 2. Percent of Musca domestica and other flies emerging from 10 DDT-treated privies: 1954

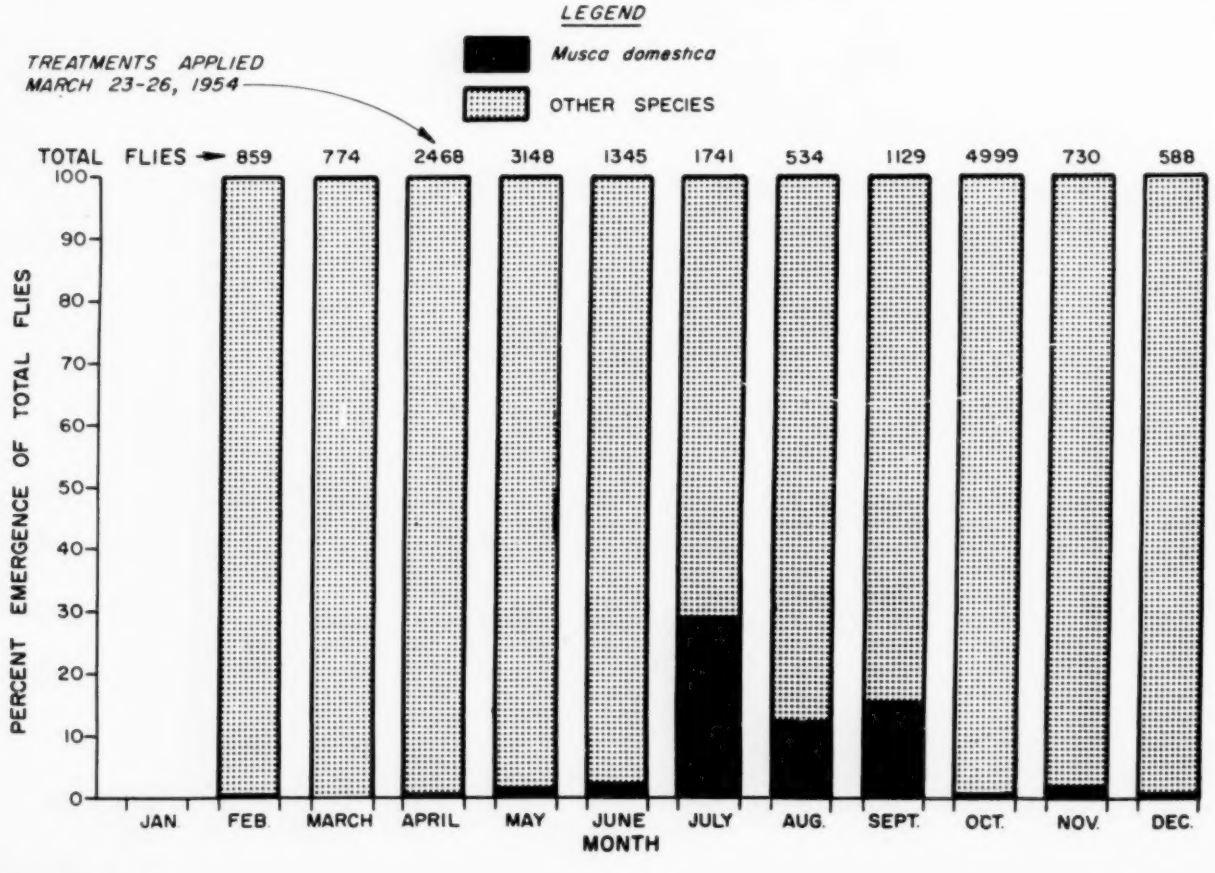
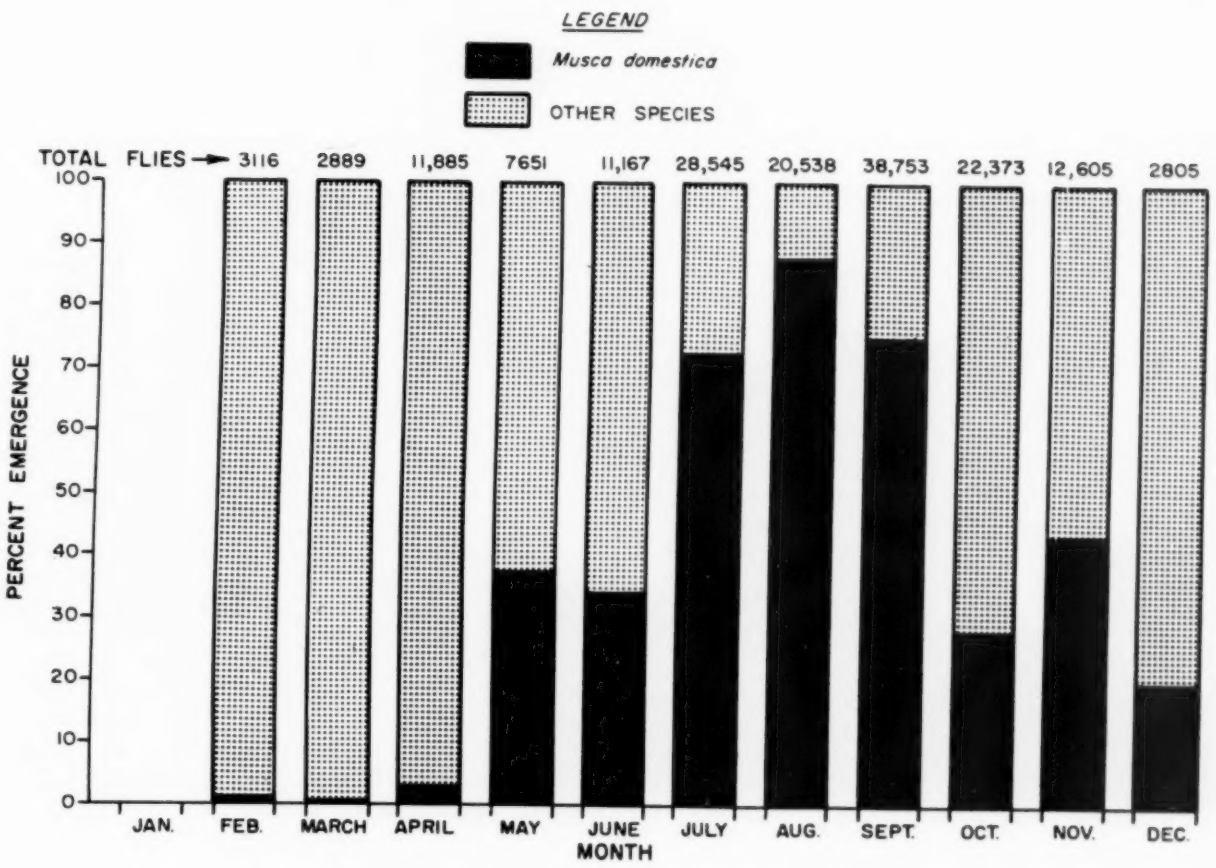


Figure 3. Percent of Musca domestica and other flies emerging from 30 dieldrin-treated privies: 1954.



December despite the fact that during those months housefly activity usually is low. In November, 12,605 flies were trapped, 5,514 of which were houseflies. A majority of the other fly species trapped during this month were either *Desmometopa* spp. or *Leptocera* spp.

Series II, III, IV

Emergence data from the privies (series II) treated with dieldrin, chlordane, and BHC are shown in figure 4. Although these data represent emergence from only 3 privies treated with each chemical, they do show that both chlordane and BHC applications can induce increased housefly breeding similar to that obtained with dieldrin residues. Although applied late in August, the treatments resulted in immediate increases in housefly production in September. In contrast, the untreated privies in the same area (3 to 4 blocks) failed to show any augmentation in housefly production. In general, housefly production from the 3 dieldrin-treated privies was considerably higher in magnitude than that from privies treated with BHC and chlordane.

Treatments were applied early in August to the inside and outside walls and pits of 10 privies (series III) in an untreated area. Pretreatment emergence of *M. domestica* averaged 1 fly per privy. In October the average housefly emergence was 228 per privy and in November, only 11 per privy. Although housefly production from this group of privies was not extremely high, it does show a significant increase, especially in October. The average production of houseflies from untreated privies during that month was only 7 flies.

Data for the 4 privies treated with aldrin and for the 6 privies that received selective treatments of dieldrin (series IV) are shown in figure 5. Housefly emergence from the 10 priv-

ies during the pretreatment period from May through September was low. However, immediately after treatment in late September, spectacular increases in housefly emergence were evident, ranging from 56.8 percent to 83.7 percent *M. domestica*. The data indicate that aldrin also induces increased housefly production, and they demonstrate that dieldrin treatment of either the riser walls or pit contents is capable of stimulating the production of *M. domestica*.

A more detailed analysis of the data from treated and untreated privies in 1953 and 1954 is shown in table 1. The average emergence of all species of flies from untreated privies in 1953 and 1954 and from DDT-treated privies in 1954 was generally of about the same magnitude. The increase in average emergence for untreated privies in September of 1953 was influenced greatly by the collection of more than 35,000 *Culex quinquefasciatus* during that period. In contrast the total fly emergence from

Figure 4. Percent of Musca domestica and other flies emerging from 3 privies treated with dieldrin, 3 with chlordane, and 3 with BHC: 1954.

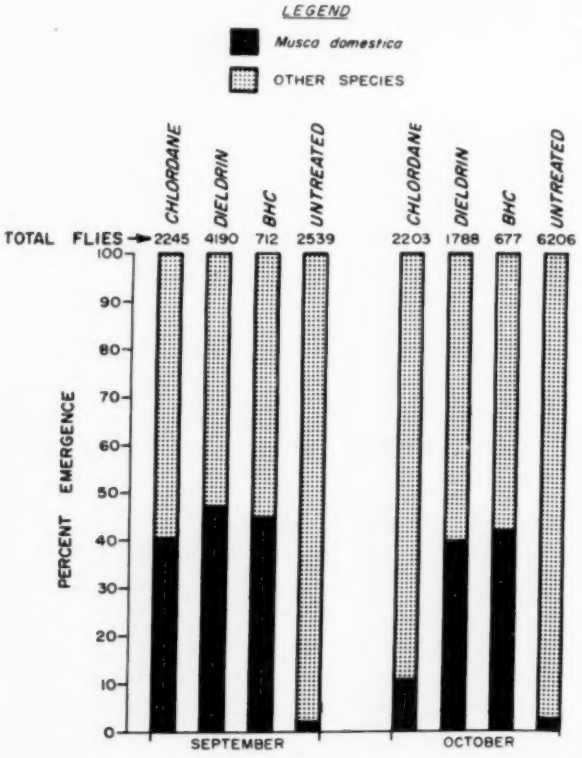
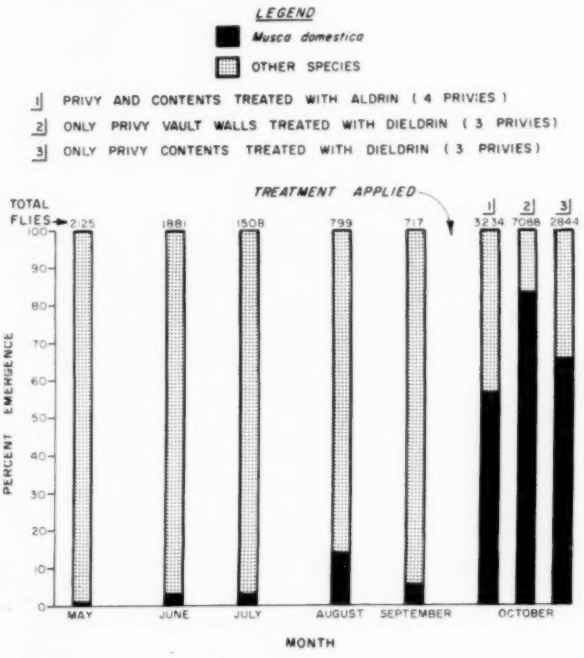


Figure 5. Percent of Musca domestica and other species emerging from dieldrin- and aldrin-treated privies: 1954.



dieldrin-treated privies shows a sharp increase immediately after the treatments were applied. This was particularly evident from July through October.

The average emergence of *M. domestica* alone from treated and untreated privies is also shown in table 1. These data are most significant in that housefly emergence from untreated privies never exceeded an average of 27 flies per privy in either 1953 or 1954, but in September 1954 housefly emergence from dieldrin-treated privies averaged 1,946 flies per privy. As previously stated, the increase in housefly emergence from DDT-treated privies in July 1954 was due primarily to production in one privy. The data for the DDT-treated area in August and succeeding months show that housefly production again reverted to a low level.

A comparative tabulation of the major species which occurred in the untreated privies in 1953 and in the privies treated with dieldrin in the spring of 1954 shows the average fly emergence per privy by months (table 2). Although variations in the magnitude of different species occur, the significance of these fluctuations appears of little consequence with the exception of *M. domestica*. *Dendrophaonia*

hilariformis occurred in fewer numbers; however, that was evident both on a pretreatment and post-treatment level. *Telmatoscopus albipunctatus*, although occurring in lesser magnitudes in September and October 1954 than in 1953, was still recorded in considerable numbers in those months (average of 168 per privy in September), and its overall influence on the increased housefly production in dieldrin-treated privies is doubtful.

In general, the changes in prevalences for species other than *M. domestica* were insignificant during the months when the housefly normally is most abundant.

Dieldrin-resistance levels of housefly populations in the treated and untreated areas are shown in figure 6. Pretreatment mortality levels in *M. domestica* from the 3 areas ranged from 53 percent in the untreated zones to 73 percent in the DDT-treated zone. Throughout the entire year mortality levels for houseflies collected in the DDT-treated area were 64 percent or above. In the dieldrin-treated areas housefly resistance increased so that in August 1954 an average mortality of only 1 percent was obtained. Housefly populations in area 5, untreated until September and situated between 2 dieldrin-treated areas, also showed a rapid increase in resistance, a fact presumably explainable by the interchange of flies between the treated and untreated areas. However, the untreated area, area 6, which was isolated approximately 10 miles from any treated area also manifested an increase in dieldrin resistance that defies a logical explanation.

Discussion

When the 1954 studies were begun, it was anticipated that several treatments and more than one fly season might be required before changes in the species composition of the fly populations would be apparent. However, within 4 weeks after the dieldrin treatments were applied, housefly indexes manifested an increase. The average emergence level per privy for April was 20 *M. domestica*. In May, it was 193, and in July, 1,374. This rapid rise also was evident in the privies receiving treatments with chlordane, aldrin, and BHC in early fall. These findings weaken the hypothesis that the cause underlying the increased housefly production is associated with a change in the physiological or behavioristic pattern of dieldrin-resistant strains. Other data antagonistic to this premise are apparent in the absence of increased housefly production in the untreated areas where the level of dieldrin resistance was high.

Despite the chemical treatments of the privies in 1954, it does not appear that any fly species was eliminated. In 1953, 97 species, 65 genera, and 33 families were recorded in emergence

Table 1. Average emergence per privy of all fly species and of Musca domestica from treated and untreated privies: 1953 and 1954

Month	All species				*M. domestica*			
	Untreated		DDT	Dieldrin	Untreated		DDT	Dieldrin
	1953	1954	1954	1954	1953	1954	1954	1954
February	142	252	172	208	1	2	1	3
March	79	175	[1] 155	193	3	1	[1] 0	1
April	696	1,019	494	[1] 792	24	1	1	[1] 20
May	900	468	630	510	10	3	15	193
June	388	352	269	744	20	13	7	254
July	[2]	151	348	1,903	[2]	5	103	1,374
August	209	96	107	1,369	3	16	14	1,204
September	1,607	135	226	2,584	6	10	36	1,946
October	859	328	1,000	1,492	1	7	7	420
November	127	949	146	840	4	27	3	368
December	108	101	118	187	1	3	1	38

[1] Treatments applied. [2] No collections made.

traps. In 1954, 123 species, 76 genera, and 36 families were recorded as coming from both treated and untreated privies. The only flies taken in 1953 and not present in 1954 were of the family Bibionidae, and only token numbers of this group were taken in 1953. Of the specimens collected in 1954, 273,046 flies (38,306 from the untreated areas and 234,740 from the treated areas) were identified; 90,209 were houseflies. Of that number, 88,443 were taken from privies that had been treated with dieldrin, and only 1,766 were taken from an equal number of either DDT-treated (945 houseflies taken) or untreated (821 houseflies taken) privies. The species captured are listed in the accompanying insert (p. 796).

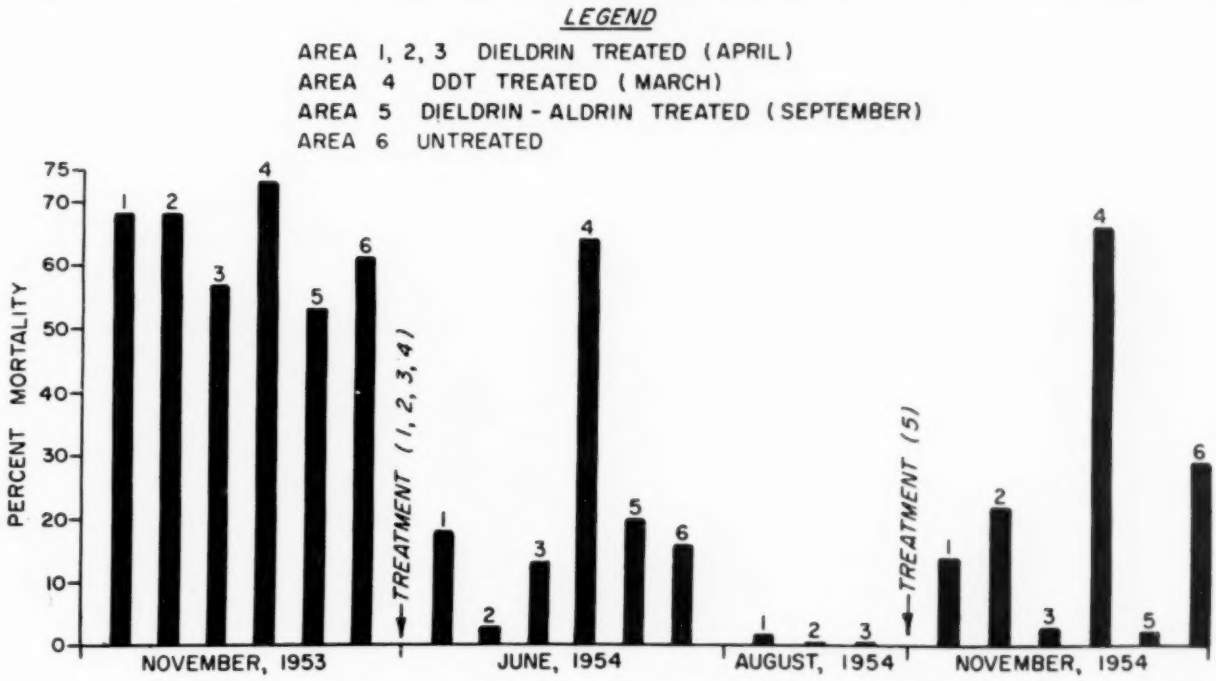
It was noted that in untreated privies larvae of the soldier fly, *Hermetia illucens*, were extremely prevalent, whereas in dieldrin-treated privies they were either absent or present in small numbers. However, in laboratory cultures seeded with *M. domestica* and *H. illucens* together in varying numbers, there appeared to be little or no detrimental effects upon

Table 2. Average emergence of 8 major fly species from untreated (1953) and dieldrin-treated (1954) privies,[1] by months

Month and year	*Musca domestica*	*Dendrophaonia scabra*	*Fannia canicularis*	*Hydrotaea houghii*	*Muscina stabulans*	*Ophyra leucostoma*	*Psychoda alternata*	*Telmatoscopus albipunctatus*
February:								
1953	2	5	32	22	21	5	0	[2]
1954	2	57	31	36	6	2	1	[3]
March:								
1953	3	280	33	20	52	77	3	[2]
1954	[3]	29	8	49	9	8	2	[3]
April:								
1953	4	327	26	25	33	35	14	[3]
1954	10	89	13	10	23	41	7	9
May:								
1953	8	51	2	[3]	38	150	538	29
1954	193	5	2	[3]	14	66	50	8
June:								
1953	20	51	[3]	0	1	89	5	84
1954	254	4	1	[3]	4	122	19	56
July [4]:								
1954	1, 374	2	1	0	2	134	29	201
August:								
1953	3	18	0	0	1	15	[3]	75
1954	1, 204	[3]	0	[3]	1	16	2	29
September:								
1953	7	11	0	[3]	1	3	7	605
1954	1, 946	[3]	[3]	[3]	[3]	6	2	168
October:								
1953	4	7	1	6	[3]	2	23	623
1954	420	[3]	[3]	1	[3]	1	33	149
November:								
1953	4	6	2	10	1	4	6	42
1954	368	[3]	3	4	[3]	1	29	9
December:								
1953	1	21	[3]	27	[3]	1	[3]	7
1954	38	1	13	7	[3]	1	6	1

[1] Dieldrin treatments applied in April 1954. [2] Identified only to Psychodidae. [3] Average is less than 1 fly. [4] No collection made in 1953.

Figure 6. Dieldrin resistance levels in housefly populations in untreated areas: 1953 and 1954.



the survival of either species. Quantitative evaluation of *H. illucens* as a breeder in privies was not obtained since the 3-week trapping period employed was less than the developmental period of this species.

The 1954 data established several additional points:

1. Increased housefly production can be induced by residual treatments of BHC, aldrin, and chlordane as well as by dieldrin applications.

2. Dieldrin treatment of pit contents alone or of riser walls alone augments housefly production.

3. In the same general area of 3 to 4 blocks, treatment of privies selected at random increased housefly production, but untreated privies showed no augmentation.

None of these points defines the factor or factors responsible for the increase in production of *M. domestica*. The possible exclusion of a competitive agent, parasite, or predator is suggested by the last two points above, but little difference is apparent in the types of arthropods frequenting the treated and untreated privies. Both DDT and dieldrin are known to persist for extended periods, yet the effect of each is different on housefly production. In contrast, aldrin, which has little residual action, produced results similar to dieldrin.

Despite the absence of any clear-cut explanation for the phenomenon, it is obvious that treatment of privies with certain chemicals increases rather than decreases housefly production from that source. Since *M. domestica* is the principal house-frequenting species, the chance of disease transmission is likewise augmented. Since untreated privies produce few houseflies, it is apparent that chemical treatment of privies should be avoided.

Further studies are now in progress in an attempt to define the factor or factors responsible for the increase in housefly production in privies treated with various chlorinated hydrocarbons.

Summary

During late March and early April 1954, near Savannah, Ga., 30 privies were treated with dieldrin, 10 privies with DDT, and 20 privies remained untreated. Within 4 weeks the dieldrin-treated privies showed a sharp increase in housefly production. Average monthly indexes per privy were 193, 254, 1,374, 1,204, and

Fly Species Collected in Privy Studies

BORBORIDAE: *Borborus* spp., *Leptocera* spp., *Leptocera ferruginata, L. fontinalis, L. venalicia, Sphaerocera* spp., *Sphaerocera equinus, S. varipes.*

CALLIPHORIDAE: *Calliphora livida, C. vicina, Callitroga macellaria, Cynomyopsis cadavcrina, Phaenicia caerulciviridis, P. cuprina, P. sericata, Phormia regina.*

CHLOROPIDAE: *Ceratobarys culophus, Hippelates pusio, H. bishoppi, H. dissidens, H. flaviceps, Madisa cinerea, Monochaetoscinella nigricornis, Oscinella* spp.

CHRYOMYIDAE: *Chryomya flava, C. salmarius.*

CULICIDAE: *Aedes vexans, Anopheles quadrimaculatus, A. crucians, Culex quinquefasciatus, C. erraticus, Culiseta melanura, Mansonia perturbans, Orthopodomyia signifera.*

DOLICHOPODIDAE.

DORILAIDAE.

DROSOPHILIDAE: *Drosophila busckii, D. affinis, D. guttifera, D. melanogaster* group, *D. repleta, D. robusta, Drosophila* spp., *Mycodrosophila dimidiata.*

EMPIDIDAE: *Drapetis divergens, Drapetis* spp.

EPHYDRIDAE: *Discocerina brunneonitens, Discocerina* spp., *Gymnopa* spp., *Paralimna decipiens, Scatella stagnalis.*

FUNGIVORIDAE.

HELEIDAE.

HELOMYZIDAE: *Amoebaleria defessa, Diastata ornata, Pseudeleria pectinata, Tephrochlamys rufiventris.*

ITONIIDAE.

LAUXANIDAE.

MUSCIDAE: *Atherigona orientalis, Coenosia* spp., *Dendrophaonia scabra, D. querceti, Fannia canicularis, F. femoralis, F. howardi, F. manicata, F. pusio, F. pusio* group, *F. scalaris, Fucellia maritima, F. americana, Graphomya maculata, Hebecnema halterata, Hydrotaea acuta, H. houghii, H. occulta, Hylemya cilicrura, Limnophora arcuata, L. cilifera, Musca domestica, Muscina assimilis, M. aurantiaca, M. stabulans, Ophyra aenescens, O. leucostoma, Schoenomyza* spp., *Scopeuma furcatum, Stomoxys calcitrans, Synthesiomyia nudiseta.*

OMPHRALIDAE: *Omphrale fenestralis.*

OTITIDAE: *Delphinia picta, Euxesta notata, Rivellia* spp.

PHORIDAE.

PHYLLOMYZIDAE: *Desomometopa* spp., *D. m-nigrum, D. tarsalis, D. tibialis, Leptometopa latipes, Milichiella arcuata, M. lacteipennis, Stomosis lutcola.*

PIOPHILIDAE: *Piophila* spp.

PSYCHODIDAE: *Brunettia nitida, Phlebotomus vexator, Psychoda alternata, P. severini, Telmatoscopus albipunctatus.*

SARCOPHAGIDAE: *Hypopelta scrofa, Sarcophaga* spp., *S. bullata, S. anandra, S. argyrostoma, S. assidua, S. dcrelicta, S. floridensis, S. galcata, S. haemorrhoidalis, S. importuna, S. laakei, S. latisctosa, S. morionella, S. ochracea, S. plinthopyga, S. pusiola, S. rapax, S. sarraccnioides, S. singularis, S. ventricosa, Sarcophagula* spp., *S. impar, S. salva.*

SCATOPSIDAE: *Scatopse fuscipes, S. notata.*

SCIARIDAE: *Bradysia* spp., *Sciara* spp.

SEPSIDAE: *Meroplius stercorarium, Sepsis punctum.*

STRATIOMYIDAE: *Hermetia illucens.*

SYLVICOLIDAE: *Sylvicola altanatus, S. marginatus.*

SYRPHIDAE: *Mcromacrus acutus, Tubifera tenax, T. dimidiatus.*

TENDIPEDIDAE.

TETHINIDAE: *Pelomyia coronata.*

TIPULIDAE: *Mumetopia occipitalis.*

TYLIDAE: *Taeniaptera lasciva.*

1,946 specimens for May through September, respectively. In contrast, average monthly indexes for the same period for DDT-treated and untreated privies were 15, 7, 103, 14, and 36, and 3, 13, 5, 16, and 10 specimens, respectively. Nine privies within a 3- to 4-block area, treated in groups of 3 with BHC, dieldrin, or chlordane, also showed increased housefly production with a low prevalence persisting in 3 adjacent untreated privies. Both aldrin-treated privies and dieldrin-treated privies with only the riser walls or the pit contents sprayed likewise produced increased housefly breeding. A total of 273,046 flies, representing 123 species, 76 genera, and 36 families, were trapped in all privies.

The low level of housefly production in untreated privies and the increased breeding of this species in privies treated with BHC, chlordane, aldrin, and dieldrin indicate that the use of these chlorinated hydrocarbon insecticides for housefly control in privies should be avoided.

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1955 Summary of Disease Outbreaks

By CARL C. DAUER, M.D., and GRANVILLE SYLVESTER

ONE OF THE characteristic features in the pattern of disease in man has been a constant change from one predominant type of illness to another. This is true even if one limits his consideration to infectious diseases. Some of the acute infections have receded with respect to incidence and others with respect to severity. Certain diseases, especially viral infections, have appeared to increase in frequency or have become relatively more important because of recession of bacterial infections. These changes may have resulted from alteration in the biology of infecting agents, different host-parasite relationships, the development of immunizing agents, improvement or deterioration in social conditions or in the environment.

The pattern of diseases in which food and water have acted as vehicles of infection has also changed. The number of waterborne outbreaks of typhoid fever and dysentery, and of milkborne outbreaks of enteric infections, diphtheria, and streptococcal infections has been reduced from several score each year to an average of less than 10. Even though reporting is far from complete there is no reason to believe that this is not a real decrease in waterborne and milkborne illness.

As these types of disease have decreased, the number of outbreaks in which foods other than milk and milk products have been vehicles of infection has become proportionately greater and possibly some types have increased in frequency. It is probable that changes in eating habits have been responsible in part for the relative increase in outbreaks of staphylococcal food poisoning and undifferentiated gastroenteritis. Mass preparation and dispensing of foods in a greater number of public eating places and schools have increased the chances of exposure to contaminated foods. It appears that the solution of human problems has not kept pace with improvements in processing and equipment and provisions for sanitation of equipment. The human problems most frequently mentioned are poor food-handling practices and failure to use adequate refrigeration of foods susceptible to contamination.

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Waterborne Disease Outbreaks

During the last 3 years there has been a continuous reduction in the number of outbreaks attributed to water—from 14 in 1952 to 7 in 1954. In 1955, there were only two outbreaks in which water was definitely incriminated. Although the exact number of cases is unknown, it is by far the smallest in recent years. In 1954, the total, 452 cases, was less than that for previous years. During 1955 one outbreak occurred among fire fighters in the mountains. They had filled their canteens from a water tank previously used to pump cesspools. The number of cases is unknown because none was very ill, and all continued with their duties. The other outbreak was among school children whose water supply was from a well contaminated by a nearby septic tank. Twenty-two cases were reported, and the investigation revealed *Escherichia coli* in the well water. Al-

though not proven, water was a possible vehicle of shigella infection in two children in a summer camp. It was also a possible source of nine cases of infectious hepatitis among school children at a camp.

Milkborne Disease Outbreaks

The number of outbreaks associated with milk and milk products has not been large (fewer than 10) in each of the last 5 years. In 1955, there were 302 cases in 3 outbreaks compared with 200 cases in 9 outbreaks in 1954. While there were only 6 outbreaks in 1952, the number of cases was about 800. Most of the cases (278) reported during 1955 resulted from 1 outbreak in which commercial milk was the vehicle. An investigation revealed a salmonella organism, group B.

The other 2 outbreaks reported in 1955 resulted from milk products contaminated with *Staphylococcus aureus* during the manufacturing process. In one, 15 cases developed after eating ice cream made in an old freezer which apparently had not been thoroughly cleaned. Contaminated cheddar cheese was associated with nine cases. Since staphylococci were found in the center of cheese from unopened samples, it was concluded that contamination occurred during the manufacturing process.

Other Foodborne Outbreaks

With only a few outbreaks in which milk and milk products were associated, naturally, a great majority have been from other foods. The total outbreaks associated with other foods reported in 1955 was 193 with 9,633 cases compared with 234 outbreaks and 11,704 cases in 1954. Reports for 1955 were received from 27 States, Hawaii, and military establishments compared with those from 35 jurisdictions in 1954.

As in 1954, foods most frequently incriminated were turkey and chicken (including eggs), custard filled pastries, ham, and beef. However, unlike previous years when potato salad was the vehicle in a number of outbreaks, there were only two associated with this food in 1955. Various other foods were associated with the remainder. In one outbreak the vehicle appeared to have been contaminated by a food handler who had hepatitis. No foodborne hepatitis was reported in 1954.

During the year only two shigella outbreaks

Table 1. Foodborne and waterborne disease outbreaks reported in 1955 by vehicle of infection

Area	Water		Milk and milk products		Other foods	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
United States	2	22	3	302	[1] 193	[1] 9,633
New England:						
Maine	---	---	---	---	2	127
Massachusetts	---	---	---	---	5	250
Middle Atlantic:						
New York	---	---	---	---	12	433
New Jersey	---	---	---	---	1	145
Pennsylvania	---	---	1	278	2	7
East North Central:						
Ohio	---	---	---	---	5	275
Indiana	---	---	---	---	3	89
Illinois	1	22	1	15	5	146
West North Central:						
Minnesota	---	---	---	---	3	180
Iowa	---	---	---	---	1	6
Missouri	---	---	---	---	3	120
South Dakota	---	---	---	---	---	---
South Atlantic:						
Delaware	---	---	---	---	1	21
Maryland	---	---	---	---	2	355
Virginia	---	---	---	---	2	52
West Virginia	---	---	---	---	3	104
Georgia	---	---	1	9	---	---
Florida	---	---	---	---	1	181
East South Central:						
Tennessee	---	---	---	---	---	---
Mississippi	---	---	---	---	1	5
West South Central:						
Arkansas	---	---	---	---	5	178
Louisiana	---	---	---	---	3	54
Texas	---	---	---	---	2	78
Mountain:						
Idaho	---	---	---	---	4	17
Colorado	---	---	---	---	1	5
New Mexico	---	---	---	---	5	992
Utah	---	---	---	---	3	154
Pacific:						
Washington	---	---	---	---	5	31
Oregon	---	---	---	---	5	44
California	1	[2]	---	---	71	2,491
Hawaii	---	---	---	---	1	14
United States 1954	7	452	9	200	234	11,704
United States 1953	11	719	4	97	194	9,914

[1] Includes outbreaks among military personnel not listed in any State. [2] Not available.

Table 2. Foodborne, waterborne, and other disease outbreaks by type of infection, reported in 1955

Area	Typhoid fever		Salmonellosis		Shigellosis		Trichinosis		Botulism		Staphylococcal food poisoning		Gastroenteritis		Toxic agents and toxic foods	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
United States	5	36	[1] 16	[1] 971	10	475	5	92	5	14	[1] 102	[1] 4, 130	[1] 66	[1] 5, 160	[1] 5	[1] 99
New England:																
Maine	---	---	---	---	1	16	---	---	---	---	---	---	2	127	---	---
Massachusetts	---	---	1	16	---	---	---	---	---	---	4	234	---	---	---	---
Middle Atlantic:																
New York	---	---	2	97	1	30	1	3	---	---	5	105	4	228	---	---
New Jersey	---	---	---	---	---	---	---	---	---	---	1	145	---	---	---	---
Pennsylvania	1	3	1	278	---	---	---	---	1	2	1	5	---	---	---	---
East North Central:																
Ohio	---	---	---	---	---	---	1	10	---	---	2	251	2	14	---	---
Indiana	---	---	---	---	1	219	1	69	---	---	1	14	1	6	---	---
Illinois	---	---	1	6	---	---	---	---	---	---	3	119	3	58	---	---
West North Central:																
Minnesota	---	---	---	---	---	---	---	---	---	---	2	59	1	121	---	---
Iowa	---	---	---	---	---	---	1	6	---	---	---	---	---	---	---	---
Missouri	---	---	---	---	---	---	---	---	---	---	2	103	1	17	---	---
South Dakota	1	8	---	---	---	---	---	---	---	---	---	---	---	---	---	---
South Atlantic:																
Delaware	---	---	---	---	---	---	---	---	---	---	1	21	---	---	---	---
Maryland	---	---	1	250	---	---	---	---	---	---	1	105	---	---	---	---
Virginia	---	---	---	---	---	---	---	---	---	---	1	12	1	40	---	---
West Virginia	---	---	---	---	---	---	---	---	---	---	2	19	1	85	---	---
Georgia	---	---	---	---	---	---	---	---	---	---	1	9	---	---	---	---
Florida	---	---	---	---	---	---	---	---	---	---	---	---	1	181	---	---
East South Central:																
Tennessee	---	---	1	3	---	---	---	---	---	---	---	---	---	---	---	---
Mississippi	---	---	---	---	---	---	---	---	---	---	1	5	---	---	---	---
West South Central:																
Arkansas	---	---	---	---	---	---	---	---	---	---	5	178	---	---	---	---
Louisiana	1	21	---	---	---	---	---	---	---	---	2	44	---	---	1	10
Texas	---	---	---	---	---	---	---	---	---	---	---	---	2	78	---	---
Mountain:																
Idaho	---	---	---	---	---	---	---	---	---	---	4	17	---	---	---	---
Colorado	---	---	---	---	---	---	---	---	1	5	---	---	---	---	---	---
New Mexico	---	---	---	---	---	---	---	---	1	4	3	900	1	88	---	---
Utah	---	---	---	---	---	---	1	4	---	---	---	---	2	150	---	---
Pacific:																
Washington	---	---	---	---	---	---	---	---	---	---	5	31	---	---	---	---
Oregon	---	---	---	---	2	16	---	---	---	---	2	7	1	10	---	---
California	2	4	6	51	5	194	---	---	2	3	35	510	28	2, 478	3	64
Hawaii	---	---	---	---	---	---	---	---	---	---	1	14	---	---	---	---
United States 1954	16	92	26	1, 164	19	1, 471	6	53	8	18	100	4, 868	103	5, 914	10	279
United States 1953	12	75	21	533	23	2, 230	13	134	7	10	81	4, 045	67	4, 226	15	606

[1] Includes outbreaks among military personnel, not listed in any State.

were reported, both of which resulted from a carrier. Of the outbreaks from salmonella infections, two were definitely associated with carriers, and it is believed that many more resulted from unknown carriers. In many instances, the source of outbreaks was not determined, but evidence of improper handling and lack of adequate refrigeration was found to be a contributing factor in most of the outbreaks.

Typhoid Fever

The number (5) of typhoid fever outbreaks reported in 1955 was relatively small compared

with the 16 in 1954, 12 in 1953, and higher numbers in previous years. One outbreak involved 21 cases in 5 related families that had contact with a carrier. Two other outbreaks were traced to carriers, one of whom was a domestic in a private home and may have contaminated food. The source of the other outbreak was not found. It occurred on an Indian reservation where a number of possible modes of spread were found, but sufficient evidence was lacking to incriminate any of these.

Salmonellosis

Thirteen outbreaks of salmonellosis were reported in seven States during 1955. This is half the number reported in 12 States and 1 Territory for 1954. Three additional outbreaks among military personnel were reported in 1955 compared with none in 1954. The total (971) cases was 17 percent less than the 1,164 cases for last year, but it is about 82 percent greater than the 533 reported in 1953.

All except one outbreak were associated with food. The exception was among persons who attended Pan American games in Mexico, and the source was not determined. In one outbreak at least 278 people supplied by one dairy were affected. Another large outbreak with 250 cases resulted from rice patties served in an institution. *Salmonella montevidio* was isolated from the rice patties, but the source of contamination was not found. In a second institution 6 persons became ill from the ingestion of frozen eggs. *Salmonella pullorum*, commonly associated with eggs, was isolated from the frozen product.

Of the remaining outbreaks, 6 were in private households, 1 in a restaurant, 1 in a club, and 1 in a hospital's newborn nursery. In only 3 of the outbreaks was a carrier found, 1 in the dairy, 1 in the hospital nursery, and 1 in a local store which sold fishcakes to the general public.

Other than those mentioned above, the *Salmonella* organisms isolated were *alachua*, *anatum*, *chester*, *enteriditis*, *newington*, *newport*, *thompson*, and *typhimurium*, and also group B. Three organisms were isolated in connection with one outbreak, and no specific etiology was assigned to it.

Shigellosis

During 1955 half (5) as many States reported outbreaks of shigellosis as in 1954. This is reflected in the number (10) of outbreaks compared with that (19) for last year. The number of cases (475) is considerably less than the 1,471 reported in 1954, probably because of the distribution of the outbreaks.

In 1955, only 2 outbreaks among children were in institutions, 1 among children in a hospital, and none among school children compared with 17 in these organizations during 1954. The majority of the outbreaks this year were in rural or substandard housing areas. Two cases developed in children in a camp and followed fecal contamination of soil or water, or both.

One outbreak involved 45 persons who attended a wedding reception. An investigation revealed that this was a catered reception, and all food items probably were contaminated by the caterer who was found to be a carrier. One other outbreak resulted from food and the remainder was considered person-to-person transmission.

Six of the outbreaks were from sonne types of organisms and 4 were flexner types. Only 3 outbreaks were traced to carriers, the source of the other 7 being unknown.

Botulism

Five outbreaks of botulism were reported in four States during 1955. Of these, 2 were of type A organisms and 2 were of type B. The other was based on clinical evidence and was not confirmed by laboratory tests. Home canned foods, olives, chili peppers, spinach, wild mushrooms, and chayote were incriminated. In one outbreak 5 individuals became ill after eating chili peppers while at work. The person who prepared the food was accustomed to canning various foods and had canned chili peppers many times before without incident. All five of the victims recovered after receiving botulinus antitoxin. However, of the other 9 cases reported, 7 resulted in death.

Staphylococcal Food Poisoning

For the last several years increases have been noted in the number of outbreaks of staphylo-

coccal food poisoning. However, the 102 reported in 1955 indicate little change as compared with the 100 for 1954. A number of these outbreaks were confirmed by bacteriological examination, *S. aureus* being isolated in 15 instances. No reports of the isolation of *Staphylococcus albus* were received. In 1954, there were 23 isolations of *S. aureus* and 3 of *S. albus*.

Epidemiological investigation in most instances failed to determine the source, but inadequate refrigeration and improper food handling were usually found. An infected food handler was found in a large number of the outbreaks associated with poor handling procedures. Unsanitary conditions were found to be contributing factors in several outbreaks. About a fourth of the outbreaks were attributed to public eating places and another fourth to private households. A smaller number of outbreaks were associated with bakeries, schools, and field lunches. Hospitals, church gatherings, and picnics were sources of only a few outbreaks.

Streptococcal Infections

A total of 353 cases of streptococcal food poisoning was reported in 4 outbreaks. One outbreak was among employees and student nurses in a hospital. About 54 hours after egg salad was served in 2 dining rooms, 116 persons became ill with streptococcal sore throat. A streptococcus was isolated from the salad and from the kitchen helper who prepared it. The helper was ill prior to reporting to work on the day he prepared the egg salad.

Another outbreak involving 181 school children developed 3 days after they had eaten ham in the school cafeteria. Bacteriological examination of the ham revealed *Streptococcus faecalis*. The meat was found to have been improperly handled. One outbreak not associated with food occurred among employees of a restaurant. No secondary cases resulted from this source, indicating none of the food was contaminated by the employees.

Chemical and Other Noxious Agents

Five outbreaks involving 99 cases resulted from noxious agents. One was from *Nicotiana glauca* mistaken for polk weed, and the other four were attributed to chemicals. One involving 50 children resulted from a dye (now prohibited) used to color popcorn. Another was from nicotine sulfate used as a spray on mustard greens. The third was from nitrite in wieners because of faulty processing. Cadmium was incriminated in the fourth and affected 25 persons.

Trichinosis

Ninety-two cases of trichinosis were reported in 5 outbreaks during 1955. Of these cases, 69 were in one outbreak among 111 members of two fraternities. Each maintained its own dining room and served "rare" pork to the members, who preferred this type of meat. No large outbreaks occurred in 1954, thus fewer cases were reported that year. However, in 1953, the case total was 134 including an outbreak affecting 73 persons in an institution. Two of the 1955 outbreaks were associated with bakeries, schools, fed hogs. Rats seen on the farms supplying the meat were a possible source of infection of the swine.

Gastroenteritis

Numerous outbreaks of gastroenteritis were reported in 1955. Epidemiological investigations of these failed to determine the etiology in all but a few. The majority were believed to have resulted from food; 2 were traced to water, and 1 to a beverage. The method of contamination was not found but improper handling of food was associated with many of the outbreaks. Inadequate refrigeration was a contributing factor in many instances. The accompanying table shows these and miscellaneous outbreaks, such as the 4 of streptococcal food poisonings with 353 cases. Also, included in the table are 2 outbreaks from paracolon organisms which affected 90 persons and 5 outbreaks probably of viral origin. A total of 922 cases was reported in these viral outbreaks.

For 16 outbreaks, although food was suspected to be the vehicle of infection, no specimens were available for bacteriological examination, and no specific item was incriminated. In other outbreaks there was sufficient evidence that a particular food was involved but in many instances none was available for laboratory

tests, or, on testing, no pathogenic organisms were found. The average incubation period was found to be much longer than the 4 to 6 hours usually found in staphylococcal food poisoning. This suggests food infection, some of which may have been salmonella infections. As suspected vehicles, poultry meat was mentioned almost twice as often as any other food, followed by beef, and a few each of creamed filled pastries, fish, and creamed meat or salads.

Five outbreaks probably of viral origin were reported, 2 in schools, 2 in institutions, and 1 in a mountain camp. Viral studies were done in at least two but in none was the etiology definitely established. However, investigations did rule out food and water as vehicles of infection. One large outbreak not listed in the table occurred among the general population in Ohio and was spread by personal contact to approximately 3,000 persons.

Animals as Sources of Human Disease

Animals are important factors in diseases of man in several respects. They may be reservoirs of infection which may be transmitted to man by direct or indirect contact. Animal products in the form of food (meat, milk, and eggs) may also be sources or vehicles of infection. Some animal products (hides, hair, and wool) may harbor pathogenic organisms which can infect man.

The importance of animals as sources of infection for man is shown by the fact that 80 different diseases may be transmitted to man. Nearly one-half of the diseases listed for reporting by States to the Public Health Service are in this category. The wide distribution of some of these infections is shown by the following figures: 48 States reported human cases of brucellosis in 1954, 41 reported tularemia, 38 reported Rocky Mountain spotted fever, and 32 reported one or more cases of psittacosis.

Animal food products such as meat, milk, and eggs may not only serve as vehicles of infection from the animal to man but they also are excellent media for the growth of bacterial agents. Poultry meat and eggs are occasionally sources of infection, mostly salmonella infections, or are contaminated during the period of preparation by organisms causing food intoxication or food infection.

In 1955, there were 30 such outbreaks reported in which about 1,600 cases of illness occurred. Of these, 25 were associated with meat and 5 resulted from eggs. Seven outbreaks, 4 from poultry meat and 3 from eggs, involving 162 cases resulted from salmonella infections. Of those associated with meat, the sources were unknown but epidemiological investigations revealed lack of adequate refrigeration. In one the meat was probably contaminated by a carrier. However, this was not definitely established because three organisms were isolated, none being from the meat itself.

S. pullorum was isolated from frozen eggs associated with one outbreak. In another, the organism was not isolated from eggs but there was good evidence that they were contaminated with *S. thompson*. In the third outbreak, there was insufficient evidence of contamination in the eggs although they were eaten by all those affected.

Fourteen outbreaks were from staphylococcal enterotoxin, 1 from streptococcus, and 7 were of unknown etiology. As would be expected in the staphylococcal poisonings, improper food handling was a common finding. Many of those with unknown etiology probably were salmonella infections because the incubation periods were longer than is usually associated with staphylococcal poisoning.

Miscellaneous Outbreaks

Three outbreaks of meningitis were reported. One was among preschool and school children in western North Carolina. Another affected two children in a family in Utah. The other occurred among Indians on a reservation and involved eight persons during a 2-week period.

Although two outbreaks of encephalitis occurred among pheasants, no outbreaks of infectious encephalitis were reported in humans during 1955. The prevalance of the disease in California, where it is endemic during the summer months, was markedly lower in 1955 than in 1954. A few laboratory confirmed cases of arthropod-borne infections were received from various parts of the country. Eastern equine encephalitis virus was isolated from pheasants

in two outbreaks. One of these outbreaks was in Florida, but cold weather set in and no mosquitoes could be collected for laboratory tests. The other outbreak was in North Carolina where several hundred horses and mules died as a result of the disease. The virus was also found in mosquitoes.

Outbreaks of diarrhea among newborn infants were reported by three States. Thirty-seven infants in six hospital nurseries developed the disease from contact with a carrier or improper sterilization procedures or both. *E. coli* was found in specimens of patients in two outbreaks and other coliform organisms were found in specimens collected in another. No reports of laboratory examination were given for the other outbreaks.

Unusual occurrences of diphtheria were reported, particularly during the latter half of 1955. For the entire year, six outbreaks of the disease were reported. Most of the cases associated with these outbreaks were among people in the lower socioeconomic group. Immunization levels in the affected areas were found to be dangerously low.

Reports of 13 outbreaks of infectious hepatitis were received from five States and Alaska. The mode of spread in most of these was given as personal contact, but some spread probably resulted from fecal contamination. Poor personal habits were given as a possible mode of spread in a few instances.

Food was determined to be the vehicle of infection in 13 cases in one outbreak. Water was suspected in two outbreaks, but there was insufficient evidence to incriminate it. In one, use of unsanitary buckets by members of a football team was considered the source; in the other, polluted water from a stream in a picnic area, used in making a cold beverage, was a possible source.

Five of the outbreaks occurred in hospitals or institutions. Four were among students. The other four were among general populations in localized areas. Although not an outbreak, 201 cases were reported in one city. Of these, 45 were diagnosed as serum hepatitis, or there was a recent history of contaminated needles and instruments.

Auxiliary Publication

Public Health Reports frequently receives contributions which, though worth documenting, pose technical or financial difficulties which prevent their acceptance for publication. Thanks to the American Documentation Institute, it is possible now to provide a reference and a central source for such material by the following process.

The author of qualified material will be asked if he wishes to have the material deposited in the ADI auxiliary publication program file at the Library of Congress, for a nominal fee ($2 for the present). If he is willing, *Public Health Reports* will publish a note to the effect that the material, briefly described, with a document number, is available from that source.

Such materials submitted by the editor will be accepted by the American Documentation Institute in the Library of Congress, entered in the auxiliary publication program file and catalog, and held indefinitely, awaiting requests for copies. Copies will be furnished at the regular rates of the Library of Congress photo-duplication service.

Such material must satisfy the regular scientific and editorial criteria of this journal. The editor's decision against publication in this journal must be dictated by financial and technical considerations only. The material may consist of an entire paper or a portion of it, illustrative, supplementary, or appendical in nature. The program does not apply to books, doctoral dissertations, or other material published separately. Authors should not offer material directly to the Library of Congress. Material may be forwarded for deposit with the auxiliary publication program only by the editor of a scientific, learned, or professional journal.

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APHA SOUTHERN BRANCH CONFERENCE REPORT

The Southern Branch of the American Public Health Association held its 24th annual meeting April 4–6, 1956, in Tulsa, Okla. Many of the papers read accented the theme of the meeting by demonstrating how some southern communities are benefiting from the advances in public health practice.

News summaries of 12 of the papers are presented here. The encouraging report that local health agencies are adopting a vector control program after successful demonstration projects in several States is the subject of one. In Missouri, another reports, educational activities in farm counties helped bring about enactment of an effective State brucellosis control law. A downward trend in dog rabies is noted in Kentucky, where public opinion brought about a State law for compulsory immunization of the canine population. Success in a program for the care of the chronically ill was reported from Richmond, Va. In Tulsa, Okla., the health department has an active voice in controlling land improvement, and in Georgia studies show that local mosquito control programs ought to start in late winter.

Other papers discussed demographic changes in the south, a method for determining the costs of administering the poliomyelitis vaccine, psittacosis control, criteria for a local mental health program, and the problem that diphtheria still presents to the southern States.

Attending the meeting were public health workers from Alabama, Arkansas, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

Diphtheria Decline Slower in South

Reviewing diphtheria morbidity and mortality data prepared by the Communicable Disease Center of the Public Health Service, Atlanta, Helen A. Moore, M.D., chief of the Diphtheria Surveillance Unit, and Grace I. Larsen, nurse officer, said that diphtheria, despite its dramatic decline, is still a residual problem in the United States, particularly in the south.

Some 2,000 cases of diphtheria are reported every year in the United States, and the fatality rate remains at about 6 to 9 percent, they said. Diphtheria cases still outnumber reported cases of brucellosis, encephalitis, psittacosis, typhoid fever, or typhus, as well as smallpox, malaria, human rabies, or anthrax, and its importance as a public health problem should not be minimized, they added.

Sample findings from the study, which is being prepared for publication, follow.

Since 1930, diphtheria decreases have been greater in the north than in the south. Seventy percent of the Nation's diphtheria cases between 1950 and 1954 occurred in the South Atlantic, East South Central, and West South Central States.

Moore and Larsen presented maps (see sample) and charts to analyze the incidence.

In the past, both diphtheria case rates and death rates recorded for Negroes have been only a fraction of those recorded for the white population in the southern States. Now, case rates are as high for nonwhite and in some instances are even higher.

Moore and Larsen said: "Intensified immunization programs among Negro children seem indicated."

Diphtheria in the south is still "young diphtheria" despite a proportional increase in incidence among adults in other parts of the country. In Georgia, considered typical, the highest rate was in the age group 1 to 4 years until 1948. Since then the rate for children 5 to 9 years old has been nearly as high or higher.

Moore and Larsen said: "The Georgia experience, which has been paralleled by a similar experience in Kentucky, may hint that a shift in age distribution of cases might occur in the southern area, perhaps not a shift to adults but to older children . . . This would point to a need, not only for very early immunization but for continued immunization throughout school life."

The diphtheria season in the southern States occurs earlier than in other parts of the country. The season can be expected to begin in July or August and to reach a peak in October.

Moore and Larsen said: "This peculiarity of season makes it vital that late summer cases be recognized so that infection may be kept out of schools as far as possible. It is equally vital that children be pro-

Reported Diphtheria Cases in 1955

tected by immunization before entering school. Ideally, of course, they should be immunized during infancy with only a recall immunization needed before school entry."

Setting Up Rabies Control In the Health Department

If canine rabies is to be prevented, restraint of the dog population, operation of the pound, and the antirabies vaccination program should all be centralized within the communicable disease program of the local health department, asserted Luther E. Fredrickson, D.V.M., M.P.H., public health veterinarian, Tennessee Department of Public Health.

"A most important element in public education is a well-managed pound, kept odor-free, with a system of accurate records," he added.

Fredrickson had concrete suggestions for organizing efficient dog control:

1. Legislation should provide that the dog shelter and the rabies control officers be under the supervision of the health officer; that all personnel have civil service protection; that owners be required to secure vaccination of their dogs; that a public health veterinarian direct the program. The ordinance should be supplemented with regulations.

2. Dog wardens and control officers must be skilled in meeting the public in addition to being adept at handling dogs.

3. A thorough record system, set up by an experienced auditor, is fundamental. It must incorporate a method of accounting, recording of cash, and auditing.

Forms for investigation of complaints on straying dogs should be filed for future reference after a complaint is closed. A daily summary should describe each dog received. A signed statement from the owner or harborer of the dog involved in a biting incident will clear the dog surrendered for destruction or adoption.

Tags will facilitate identification of lost dogs. Owners should be notified. Proper forms for recording the location and condition of biting dogs during the period of quarantine are necessary to physicians treating victims of dog bites.

4. Equipment should be designed to provide for easy cleaning, protection of personnel, and proper care of the dog.

A thorough daily cleaning schedule will keep the pound and vehicles free from obnoxious odors.

Equipment for the pound should include various types of brushes, facilities for the hot detergent as well as a sanitizing agent, and a well-designed sewer system. Water taps, hot and cold, should be at convenient locations.

The examination room should be equipped with tables for vaccinations, examinations, and autopsies, with refrigeration for vaccine and the preservation of dog carcasses pending laboratory examination, and with hot and cold running water.

Ventilation of collection vehicles should be designed so that children are not able to reach through the openings to pet a dog. The vehicle bed should provide drainage. Metal is the most suitable material for the truck compartments.

Secure, individual compartments for rabies suspects are necessary both in the truck and at the pound. A separate section of the shelter should be reserved for cages of rabies suspects.

5. The areas of the community in which rabies control officers can best prevent new cases of animal rabies can be determined by epidemiological studies.

Areas that have yielded rabid animals should be intensively patrolled. Strenuous efforts must be made to locate animals and persons bitten by a rabid dog. Exposed animals should be destroyed immediately, or, at the minimum, quarantined for 6 months.

Areas with low percentages of vaccinated dogs should be given particular attention. Sections where less than 80 percent of the dog population is protected by current vaccination are likely sources of rabies outbreaks.

6. The public ought to visit the pound, except where rabies suspects are quartered. Visitors can learn from employees how the community is protected against rabies. The dog shelter may be included in the field trips planned for school children.

Missouri Gains Legislation For Brucellosis Control

Missouri's activities in brucellosis control, culminating in an effective State law in August 1955, were reported by Edmund R. Price, D.V.M., public health veterinarian and assistant director of the bureau of communicable diseases, Missouri Division of Health.

The high prevalence rate of brucellosis was indicated in a 1951 Federal report, stating that 6.7 percent of the cattle in the State were positive to the blood agglutination test.

The Missouri Division of Health had urged adequate legislation for years, but its efforts were accelerated in the past 5 years, Price indicated. The division conferred frequently with leaders of the several brucellosis committees that had been appointed since 1940 to advise on legislation. Projects included an education campaign, a milk ring test survey, and an epidemiological investigation of human brucellosis cases.

In 1951, four copies of the film "The Triple Threat of Brucellosis" were made available to all the schools, PTA's, and farm and civic organizations through the division's bureau of health education. Several hundred thousand persons, in urban as well as rural areas, saw this film. In many counties, health personnel used the film as a primary part of their school health education program. In other counties, the local health departments held area symposiums on brucellosis. Many radio scripts and newspaper releases were prepared for local use. Thousands of pieces of literature were sent out by the bureau of health education, and all of the State health agency's envelopes carried the postmark "Stamp Out Brucellosis."

The milk ring tests, conducted in 1952 by the division's bureau of laboratories, yielded a brucellosis infection rate of 38.2 percent in 708 herds supplying 6 cities. The survey was

limited to milk ordinance cities in which the local health department requested tests. The bureau was also instrumental in getting tests in the three larger metropolitan areas in the State.

The rate found in the cross-section survey compared favorably with the 37.7 percent rate of infection found in 67,000 dairy herds by the Missouri Department of Agriculture in 1953 in the first statewide ring tests, Price said.

Other phases of the statewide survey were voluntary blood testing at the owner's expense and intensified calfhood vaccination. In a second round of statewide milk ring testing in 1955, the infection rate had dropped to 18.5 percent in 148,177 herd tests. Blood tests of 776,087 cattle during the same period showed 22,141 reactors, or an infection rate of 2.8 percent for brucellosis.

In an epidemiological investigation in 1953–55, the Missouri Division of Health attempted to ascertain the frequency of human brucellosis in a rural area, the probable mode of transmission, and the most prevalent species of *Brucella*.

The study area was confined to 18 counties in district 3 in west central Missouri, a diversified farm area that produces some milk for the Kansas City market. However, most of the dairies are small and produce ungraded milk.

From blood specimens submitted to the bureau of laboratories for routine agglutination studies, all subjects with blood agglutination titers of 1:80 or higher were selected for this epidemiological study.

Of the 62 investigations completed, 35 of the patients were acutely ill and 20 had chronic cases, according to their physicians. (Four did not have brucellosis; 1 veterinarian and 2 veterinary students were not investigated.)

Twenty-eight (80 percent) of the 35 acute illnesses were found in persons having direct contact with infected animals or their discharges, and 7 (20 percent) were attributed to the consumption of infected raw milk or milk products.

Cultures were attempted on all specimens, and 9 isolations were identified, all of them *Brucella abortus*. Seven of the isolations were from the 28 cases attributed to animal contact (2 of them might have been swine contact), and 2 were from 7 cases of probable milk origin.

The epidemiological findings, Price concluded, compare with those elsewhere in the midwest, with the exception that in this area of Missouri the primary causative agent thus far isolated is *Brucella abortus*.

Kentucky Reducing Rabies In Dog Population

Public opinion in Kentucky was so aroused after a Louisville boy died in 1953 from the untreated bite of a stray dog that rabies immunization for dogs became compulsory in 1954.

Ronald L. Hectorne, D.V.M., director, division of veterinary medicine, Kentucky State Department of Health, said that under Kentucky's 2-year-old rabies law the State department of health is responsible for vaccinating all dogs and the State department of agriculture for licensing dogs, collecting strays, and maintaining dog pounds. Local health departments were asked to set up vaccination clinics in cooperation with local veterinarians.

More than 4,000 clinics have been held since the act became effective on July 1, 1954, and more than 200,000 dogs have been vaccinated.

To serve eastern counties, in which there are few accredited veterinarians, a veterinarian has been employed to conduct clinics. In other counties lacking a resident veterinarian, veterinarians from neighboring counties have come in to conduct clinics. In this way, the State with the cooperation of the Kentucky Veterinary Medical Association has overcome a major obstacle in administering the law.

During the 2-year period ending December 31, 1955, 125,652 dogs had received the chick embryo (avianized) vaccine, and 81,193 the brain tissue vaccine. The chick embryo vaccine is used at all local clinics sponsored by the health department.

Dogs vaccinated in the clinics wear a standard tag containing the vaccine manufacturer's name, the serial number of vaccination, and the year of vaccination. The color of the tags is changed each year.

The success of the program is shown in the downward trend of rabies in the dog population. Laboratory-confirmed rabies has been reduced from an average of 398 positive cases during the 5 years before 1954 to 261 in 1954 and 120 in 1955. Rabies infection verified in dog heads submitted for examination has fallen from 44 percent in 1953 to 30 percent in 1955.

Rabies in wildlife, however, is on the increase in the State, Hectorne reported. The State health department and the Kentucky State Fish and Wildlife Department are trying to reduce the fox population.

Florida Sets Tentative Cost For Administering Vaccine

Preliminary calculations indicate that 64 cents is the cost of administering a single injection of poliomyelitis vaccine in Florida. Since 90 percent of all poliomyelitis vaccine distributed by the Florida State Health Department goes to county health departments, a time-cost study was run in 5 selected counties to estimate administration costs for the entire State.

Representing the county health department in Orange County, Wade N. Stephens, M.D., M.P.H., Orlando, explained how the estimated figure was derived. Time-cost records were kept in health departments in Franklin, Gulf, Leon, Orange, and Wakulla Counties for 7½ months, ending February 29, 1956.

The per dose cost of administration to the local health department is found by dividing local cost by number of doses given (table). The sum of individual employee costs plus cost of supplies, excluding vaccine, equals the monthly cost of the poliomyelitis program to each health department.

To obtain individual employee costs, multiply the total hours worked each month by an employee

Cost of giving vaccine in 5 Florida counties

County	Total local cost [1]	Doses administered	Cost per dose
Orange	$4, 165. 88	6, 367	$0. 65
Leon	2, 687. 46	8, 093	. 33
Gulf	1, 149. 64	1, 033	1. 11
Franklin	582. 21	223	2. 61
Wakulla	772. 46	493	1. 57
Total	$9, 357. 65	16, 209	$0. 58

[1] August 12, 1955, to February 29, 1956.

by his hourly wage, calculated on the basis of a 40-hour week. To this amount, add the number of miles he travels, multiplied by 7½ cents.

To obtain an approximation of the total local cost throughout Florida, multiply the average cost per dose in the five counties by the total number of doses given throughout the State: $0.58 (average cost per dose, from table) × 228,264 (total doses given in State) = $132,393.12 (total local cost in State).

Add to this the State administration costs: $132,393.12 (local cost) + $14,779.03 (State cost) = $147,172.15 (total cost).

To calculate the total cost per dose, divide the total cost figures by the number of injections given: $147,172.15 (total cost) ÷ 228,264 (number of injections) = $0.64.

Changes in Demography Challenge Public Health

Future population growth of the south will take place in urban areas, stated Matthew Tayback, Sc.D., director of the statistical section, Baltimore City Health Department. He based this prediction on trends in population growth and movement since 1920.

Discussing the implications for public health of this and related demographic trends in the south, Tayback urged public health authorities to reconsider their responsibilities. Of particular importance, he said, are these characteristics of an urban culture: (*a*) families have limited contact with their relatives, (*b*) large numbers are crowded into small areas, and (*c*) the rigid discipline of hours and methods of labor creates mental and emotional stresses.

Tayback considers adequate coverage of the population with medical and nursing skills the first essential for a sound preventive medical program. To a large extent, he said, this coverage can be provided through existing services of personal physicians and hospital centers. But in many instances, facilities for diagnosis of cancer, detection of early emotional disorders in children, home nursing care, and the like, are lacking.

"The public health department will demonstrate its maturity and usefulness to the modern urban community by the statesmanship it exhibits in the solution of such unmet needs," he declared.

The full text of Tayback's presentation is scheduled for publication in the *American Journal of Public Health*.

Florida Refines Cost Figure

A final study, completed June 30, 1956, is expected to show more precisely the cost of administering a single injection of poliomyelitis vaccine in Florida. In developing the 64-cent figure reported on this page, Dr. Stephens had as his immediate purpose the demonstration of a method of estimating the cost. In April 1956 Dr. Joseph Bistowish of Tallahassee completed a similar study in which he found 36 cents to be the cost of administration per injection. There is reason to believe that the actual figure is still lower.

Says Psittacosis Control Should Start Now

Two approaches to the problem of controlling psittacosis were suggested by Martin P. Hines, D.V.M., M.P.H., chief, veterinary public health section, North Carolina State Board of Health.

The first is to accept the fact that direct control over birds carrying the virus is not possible or practical and to direct attention and efforts toward alerting the public and physicians to the dangers that exist, he declared.

The second is to consider reestablishment of a Federal ban on interstate and import shipments of psittacine birds except from certified aviaries. This would not be possible without funds, he asserted. If the cost of certified birds could be kept between $15 and $20, bird certification would be practical, he thought.

He described a number of past infections in humans that occurred in North Carolina and pointed out that the veterinary section is at present investigating 50 psittacosis cases. He claimed that the source of infection in North Carolina is parakeets, and, "... with the exception of Texas and Oregon, it is the same elsewhere . . ."

The incidence of psittacosis was low prior to 1951 when the Federal ban on interstate shipment of psittacine birds was lifted, Hines said, but during the past 4 years the incidence has increased almost 800 percent. The degree of increased psittacosis incidence will not be known until physicians are alerted to suspect psittacosis in atypical

pneumonias and ill-defined fevers, he asserted.

Interstate shipments of parakeets are so large and numerous that North Carolina's present program of investigating bird populations suspected as the sources of human psittacosis infections and destroying aviaries where infection is found seems grossly inadequate, he declared.

Vector Control Projects Found Successful

The key to the encouraging success of the community vector control demonstration program has been its acceptance by the public, according to Charles E. Gerhardt, M.S., vector control consultant to the Communicable Disease Center of the Public Health Service.

Local health agencies have adopted permanent programs of environmental sanitation for vector control on a par with such programs as food, milk, and water sanitation, he asserted.

Demonstration projects at Pueblo, Colo., and Kansas City, Kans., have been completed. Projects at Laredo, Tex., Boise, Idaho, Cedar Rapids, Iowa, and Gadsden, Ala., are current, he reported.

In one area, Gerhardt said, 500 cesspools were replaced with proper facilities; in another area, 1,800 outdoor privies were razed. Miles of sewer extensions have been laid, and several million dollars worth of bonds have been approved for future extensions.

At all projects, garbage and refuse storage, handling, and disposal practices have been notably improved, and, he added, the improved practices have been adopted by a number of nearby cities. In several communities the application of the recommended garbage and refuse handling methods resulted not only in an improved environment for the control of communicable diseases but in savings of more than the cost of the demonstration program. Also, he said, some property and land values increased, and some previously unusable land was reclaimed.

Industry has been cooperative, Gerhardt commented, in correcting major problems of industrial wastes disposal, and the keeping of large animals in cities has been eliminated or controlled through enforcement of legislation.

Participation in Projects

A city or county is selected for a demonstration project on the basis of vectorborne or related disease problems, location in relation to other cities, need for general improvement in environmental sanitation, the attitude of local government officials and citizens to change, and ability to finance the program. Direct requests from State and local health authorities also have a bearing on the decisions, Gerhardt said.

Federal participation consists primarily of providing a technical supervisor, assigning vehicles, and supplying spraying equipment, training, and educational aids. The technical supervisor is assigned to the local health agency for a period of 2 years. He conducts the program according to State and local health department policy.

Of primary importance is the assignment by the local health agency of a qualified person to assist the technical supervisor with surveys, evaluation, project details, and who will take over direction of the program when the technical supervisor leaves, Gerhardt asserted. The local health agency also provides office and shop space, manpower, chemicals, enactment and enforcement of necessary legislation, and obtains interdepartmental cooperation.

Endorsement of the project by the State is a primary requisite, he said. State participation in the project varies according to State policies. Some States supply travel funds for observers from other cities.

Development Procedures

Gerhardt mentioned procedures in the development of a typical community vector control demonstration project, including a community-wide survey to evaluate and delineate insect vector problems; legislative needs; garbage, refuse, and industrial waste handling and disposal standards; animal maintenance; extension of sewerage systems; insect and rodent control; and educational activities.

Education is vital to the success of the program and is used in a "do-it-yourself" context. The community thus develops its own skills, abilities, and interest. Such interest is the best assurance that the program will be actively continued and supported after Federal participation is withdrawn, Gerhardt said.

Mental Health Action Criteria Outlined

The director of a local mental health program must deal with the interrelationships of all individuals in the community. His decisions affect the behavior of the public and bring about action to destroy adverse predisposing influences and to nurture favorable ones, said Guy V. Rice, M.D., director of health conservation services, Georgia Department of Public Health.

All action promoted by the health officer in developing a community mental health program, Rice said, occurs in the following places: the home (including the hospital), the church, the school, the "factory," and the playground. It will pertain to one or more of the following factors: understanding and acceptance, replacement and substitution, anticipatory guidance, "built-in reactor," and support.

Specific Programs

Rice listed eight specific programs which he said can bring about improvement of a community's mental health:

General education to bring about understanding of mental illness and to dispel fear and stigma.

Attack on maternal deprivation through relocation of children with their mothers or arrangement for care by a permanent mother substitute.

Preparation for physiological or other crises, such as childbirth, caring for an infant, adolescence, and old age, by providing educational material or holding special classes.

Special education for leaders, beginning possibly with teachers since teachers train the future leaders of the country. (Studies by the Army and others have shown that units commanded by persons following sound principles of leadership, including a more permissive attitude toward their men, have fewer casualties resulting from emotional disturbances than units commanded by persons who do not recognize individual responsibility.)

Supportive services for families of the mentally ill, possibly as a part of a generalized public health nursing program.

Treatment in general hospitals for the mentally ill. The public health department could underwrite and supervise treatment for those unable to pay, as it does for patients with cancer, tuberculosis, or other diseases.

Custodial care with long-term treatment for those who do not respond to rapid, intensive treatment in the general hospital.

Special guidance for children exhibiting emotional disturbances not likely to be resolved by eliminating the adverse influence of maternal deprivation.

Research and Evaluation

In determining the action needed in the community and evaluating the program once it is under way, it is necessary to develop criteria to use in selecting priorities, Rice stated. He listed the following criteria developed by the local and State mental hygiene staffs of the Georgia Department of Public Health:

The degree to which there is—

1. Readiness for the services on the part of the community or the administrative unit.

2. Potential for reaction with or effect on persons in positions of authority.

3. Facilitation of communications and prevention of isolation among communities, administrative units, and individuals.

4. Enhancement of personality growth and development.

5. Active public interest.

6. Potential for raising the general level of mental health services in the community.

7. Potential for the prevention of mental illness.

8. Potential for community self-appraisal.

9. Socioeconomic capacity of the administrative unit or community to support the service.

10. Potential for integration with other services or programs.

Not only have these criteria been of value in determining what action is needed, but the process of outlining them has given us a better understanding of our own program, Rice declared.

After the director has reviewed the possible programs which he might develop and has weighed them against the criteria to determine their priority and has decided which to include, he must then decide what type of staff will be necessary to accomplish the objectives. Rice urged that the utmost care be exercised in selecting staff. Not only must their professional qualifications fit them for the job, but their personal ones as well, he said.

Blends City's Services For Long-Term Patients

Joint planning of health programs by civic groups and voluntary and official health agencies, a method used in Richmond, Va., since 1906, has proved particularly effective in care of the chronically ill, according to a report by four members of the Richmond Department of Public Health.

The four members are: E. M. Holmes, Jr., M.D., M.P.H., director of public health for Richmond; P. W. Bowden, M.D., M.P.H., chief of the bureau of preventive medical services; W. R. Harton, Jr., B.S., chief of administrative services; and Alan N. Young, B.S., chief of health information. All are on the staff of the Medical College of Virginia.

Civic groups are brought into health planning through the Richmond Area Community Council. Through contracts and agreements with the official agencies, a large part of the voluntary agencies' funds is expended for joint or cooperative projects.

The report by Holmes and his associates outlined the community council's work on chronic illness and related problems during the past 8 years. Council recommendations have been followed in reorganizing the medical care program for the indigent, forming a combined health department–visiting nurse association nursing service, and establishing various clinics.

The council initially assigned special subcommittees to study (*a*) existing hospital, nursing home, and convalescent facilities; (*b*) the community's rehabilitation facilities; and (*c*) facilities for medical and nursing care in the home.

The study of nursing home and convalescent care facilities, they said, revealed a great shortage of beds for Negro patients, a marked preponderance of beds for white women, and the problem of slow turnover of patients. It also showed that the cost in many homes was beyond the financial means of a large portion of the population. Another subcommittee offered the following recommendations:

1. That full use be made of private nursing home facilities on a contractual basis.

2. That the City Home, an institute for the care of the aged administered by the city's welfare department, be converted to a nursing home.

In 1953, the conversion of the City Home was accomplished. Admissions are coordinated through the health department's bureau of medical aid, which assures the use of the home as an integral part of the chronic disease medical care program.

Home Care Program

Richmond's present medical care program for the indigent is based on recommendations of the community council subcommittee assigned to study the health department's home medical care services. This program, according to the report, provides both quality of care and continuity of service from the home to the hospital and back to the home. Lack of continuity of service

was one of the weaknesses of the old system, in which home care was provided by physicians employed part time and hospital care was provided on a contractual basis by the Medical College of Virginia Hospital. The only records were charge slips. Physicians on home care did not see their patients in the hospital or outpatient clinics and received no reports from these services.

Under the new program, comprehensive medical care is provided through agreements and contacts with hospitals, clinics, nursing homes, and institutions for the incurably ill. The use of the patient's home for medical care is extended through use of the housekeeper service of the Family Service Society and equipment from the Sickroom Loan Chest. The Instructive Visiting Nurse Association and the Richmond Department of Public Health's nursing service, functioning as a combined unit, provide bedside nursing and public health services for patients on a referral basis. (A detailed description of the program was published in A Study of Selected Home Care Programs, Public Health Monograph No. 35, 1955.)

Another feature of the medical care program for the indigent is the dental clinic organized in 1950. It is sponsored jointly by the Richmond Department of Health and the School of Dentistry of the Medical College of Virginia.

Nursing Services

Increasing demands for bedside nursing services led to the establishment of a combined nursing unit in which the Department of Public Health and the Instructive Visiting Nurse Association participate. Set up first as a demonstration project for South Richmond, the combined unit became citywide in January 1953.

Appraisal of the combined unit after 3 years' experience shows it to be economical and efficient, Holmes and his colleagues remarked. It provides better quality care and eliminates duplication of services. These advantages, they said, have made possible the provision of the bedside nursing care required by the new home care program.

Special Clinic

In 1954, a committee was designated by the community council to study the problem of facilities for the handicapped child. The committee recommended that a diagnostic and evaluation clinic be established, that it be operated cooperatively by at least the Department of Public Health and the Medical College of Virginia, and that all related voluntary health agencies participate in the planning and financing.

On the strength of these recommendations, a governing board was established early in 1955. Under the leadership of this board, the Richmond Council of Jewish Women, the Medical College of Virginia, and the Department of Public Health, supported by 13 voluntary agencies, undertook to set up the proposed clinic. In November 1955, the clinic held its first session in facilities provided by the Medical College of Virginia.

Tulsa's Health Department Helps Plan City's Future

In Tulsa, Okla., described as a "frontier village that had burst its seams," the health department has joined local city and county agencies in planning for the long-range expansion of the city and its environs beyond its present boundaries, according to Clyde B. Eller, director of the sanitation division of the Tulsa City-County Health Department.

The instrument through which unincorporated subdivisions in the counties surrounding Tulsa are achieving orderly growth is the Tulsa Metropolitan Area Planning Commission. Established in April 1953, the commission was created to cut across red tape hampering postwar efforts to control land improvement. A health department representative is a member of the technical review board of the commission.

Long-Range Studies

Long-range planning and comprehensive zoning by the commission are developing patterns for tomorrow's thoroughfares, freeways, parks, shopping centers, and other community facilities for neighborhoods as yet unborn, Eller stated. The health department is sharing in these projects by planning an air resources study to avoid the necessity of an air pollution control program 20 years hence, by conserving and rehabilitating housing in present transition neighborhoods, and by seeking to anticipate future garbage collection and disposal problems, he added.

Eller said that the commission passes on the basic design of proposed subdivisions: on size, arrangement, type of streets and intersections; on access, size, and shape of lots; on location of easements and building of setback lines; provision for offstreet parking; public open spaces and other requirements.

In addition, the health department, through its representative on the commission's technical review board, passes on the adequacy of present land improvements which might affect the planned network of future streets, water lines, and sewers, Eller said. Many of the regulations under which the commission operates were drafted with health department advice and with the department's open support in public hearings, he added.

Eller quoted portions of two regulations as illustrative of the requirement that proposed water supply and sewage disposal systems have health department approval.

Approval Procedure

Eller also explained the procedure by which subdivision developers obtain approval of sanitary installations:

The planning commission reviews the preliminary subdivision plat for obvious inconsistencies with design standards, then schedules it for discussion at the next weekly meeting of the technical review board. At that meeting, attended by the developer and his engineer, the plat receives detailed, constructive review by representatives of the city, county, and traffic engineer, the water and sewer department, the health department, and the planning staff. If warranted, representatives

of public utilities and of other local, county, and State groups also are present.

Their comments are used by the developer to revise his preliminary plat for presentation at the next convenient weekly meeting. The plat then passes to an official citizens' commission for approval, and the developer can proceed to prepare the final plat for filing.

If sanitary sewers are not available at the time the preliminary plat is submitted, the results of at least one soil percolation test and one 48-inch core test per acre are required. The plat must also be accompanied with an accurate topographic map. This material, together with aerial photographs and information obtained from field trips and actual experiences in nearby areas, permits careful analysis of all conditions. In the event that semipublic or private water supplies are planned, the availability of adequate, potable water must be substantiated in the form of information from test wells or affidavits from competent geologists or nearby residents with wells.

These regulations apply both to formally platted subdivisions and to small tracts or lots, Eller stated, adding that all applications for proposed sanitary installations within the jurisdiction of the commission must be submitted to the health department.

House Mosquitoes Breed During Georgia Winter

In Georgia from the fall line southward, *Culex quinquefasciatus*, the tropical house mosquito, breeds and survives throughout the winter, according to studies in Columbus and other cities of the State in 1955–56. These studies were reported by Orlin K. Fletcher, Jr., M.P.H., biologist, Georgia Department of Public Health, and Leon Flanagan, insect control officer, Muscogee County (Ga.) Health Department.

This evidence suggests the need for starting mosquito control operations in late winter, Fletcher and Flanagan indicated. They reasoned that reproduction and survival of the mosquitoes during the winter results in a buildup of the mosquito population early in the spring and summer.

In Columbus, the studies demonstrated the presence of egg rafts, larvae, and both male and female adult mosquitoes in the street catch basins during most of the fall and winter months. Similar conditions were observed in other cities of the State.

Even in abnormally cold weather, they said, the mosquitoes are occasionally so numerous as to create control problems. In Columbus, complaints of biting activities became so vociferous in December that it was necessary to larvicide the street catch basins in one section of the city. In Baxley, complaints were received with such frequency during the winter months that routine larviciding operations were continued throughout the winter.

Course in Laboratory Diagnosis of Tuberculosis

A course in laboratory methods in the diagnosis of tuberculosis will be offered by the Public Health Service under the joint sponsorship of its Division of Special Health Services and its Bacteriology Laboratories of the Communicable Disease Center, Chamblee, Ga., from January 21 through February 1, 1957.

All grades of employed laboratory personnel, including laboratory directors and senior laboratory staff members, who are approved by their State health officers are eligible for the course.

Practical laboratory training in all phases of tuberculosis bacteriology, including preparation of culture media, microscopy, cultural procedures, diagnostic use of animals, and testing of drug sensitivity will be included in the course.

No tuition or laboratory fees are charged. Reservations for this course should be made well in advance.

Information and application forms may be obtained from Laboratory Training Services, Communicable Disease Center, Public Health Service, P. O. Box 185, Chamblee, Ga.

technical publications

Civil Defense Information for Food and Drug Officials

Food and Drug Administration Publication. Unnumbered. 1955. Compiled and edited by Lowrie M. Beacham, Jr., and Harold V. Leininger, Homer J. McConnell, Joseph A. Mathews, and Alan T. Spiher, Jr. 188 pages; illustrated.

The basic information about nuclear, radiological, chemical, and biological warfare agents in this civil defense handbook is designed to give food and drug officials, confronted with the aftermath of an attack, knowledge that will permit them "to decide what must be done and how it can be accomplished."

Part 1 covers postattack problems and operations and summarizes the probable duties of a food and drug official should an attack occur. Part 2 presents the scientific aspects of radioactivity, fusion, fission, and fission products, biological effects of ionizing radiation, chemical warfare agents, and the fundamentals of biological warfare. Part 3 reviews the basic scientific tools for a better understanding of radiology.

A limited number of copies of the handbook are available to those with civil defense responsibilities, without charge, from the Food and Drug Administration, Washington 25, D.C.

Guide to Making a Survey of Patients Receiving Nursing and Personal Care

Public Health Service Publication No. 454. 1955. By Jerry Solon, Dean W. Roberts, and Dean E. Krueger. 55 pages; exhibits. 75 cents.

This guide, an outgrowth of a specific study by the Commission on Chronic Illness and the Public Health Service, presents a tested method for States and local communities to use in discovering what types of patients and care are found in establishments or programs that provide nursing or personal care. Thirteen States participated in the study. Interest of other States has led to the issuance of the survey methodology for general use.

The types of information studied include personal and social characteristics of the patients, their medical condition, nursing care and attendance by physicians, activities engaged in, charges incurred, and sources of funds for care.

Interest in such a study may stem from health and welfare planning groups, standard-setting and licensing authorities, public welfare agencies financing care of clients, and from owners, governing bodies, and administrators of the facilities. To them the manual offers a method of conducting a survey, providing for their use a survey schedule, classification of facilities, techniques for collecting data, editing and coding instructions, and tabulating procedures.

Nursing at the Clinical Center

Public Health Service Publication No. 468. 1956. 12 pages; illustrated.

A two-color, illustrated booklet just published describes the opportunities available to nurses in the Clinical Center of the National Institutes of Health.

The brochure explains how nurses serve as important members of the medical research teams, the clinical services to which they may be assigned, and what the typical nursing unit is like. By means of questions and answers, detailed information is given about the kind of training required, the salaries to be expected, and the opportunities for advancement.

The pamphlet is available to nursing schools, State nursing registers, hospitals, State and local health departments, and other agencies concerned with nursing activities.

Patients in Mental Institutions, 1952

Part I. Institutions for Mental Defectives and Epileptics

Public Health Service Publication No. 483. 1956. 56 pages. 35 cents.

Based on the 27th annual census of patients in mental institutions, this report is the first part of the sixth such census to be conducted by the National Institute of Mental Health.

For the first time since its inception in 1923, the annual report will be published in four parts, permiting a more expeditious and flexible medium of presentation. The other parts, Public Hospitals for the Mentally Ill, Private Hospitals for the Mentally Ill and General Hospitals With Psychiatric Facilities, and Private Institutions for Mental Defectives and Epileptics, will follow. Pending the publication of these parts, information on subjects treated therein may be obtained from Dr. Hyman Goldstein in the Biometrics Branch of the institute.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

The Sanitary Engineer in Hurricane Floods

By FRANK TETZLAFF, C.E., M.C.E., K. C. LAUSTER, B.S.M.E., M.S.P.H.E., and RICHARD S. MARK, B.S.S.E.

WARNED by radio and newspaper stories on the morning of Friday, August 19, 1955, Public Health Service engineers in the New York regional office curtailed normal activities in readiness for Hurricane Diane.

The anticipated calls for assistance failed to come in during the day. By Saturday morning, August 20, the reasons became clear: Communications had failed, and few people were aware of the immensity of the disaster. In some States, authorities had to wait for the floodwaters to recede before they could determine what assistance would be required. Nevertheless, 10 inches of rain in a 24-hour period over an area extending from the Poconos in eastern Pennsylvania, across the Catskills and Berkshires, and into Connecticut and Massachusetts portended a national emergency.

Not until the following week did the extent of damage become known. Experience could lend no clue. There was no previous record of so great a rainfall. In northwestern Connecticut, the maximum rainfall was estimated at 20 inches.

The newspapers quoted a general in the Army Corps of Engineers as saying, "Floodwaters have caused more damage in Connecticut in 2 days than all of the strategic bombing in the Ruhr Valley during the entire World War II."

In Winsted, Conn., floodwater from the Mad River reached 9 feet above any known previous record.

Easton, Pa., reported the Delaware River 5 feet above the previous maximum record.

A 300-year-old house in Connecticut, never before flooded, was swept away.

A 100-year-old dam in the Peekskill, N. Y., area had 7½ feet of water over its spillway. The previous record was 4 feet.

Three miles of a 36-inch water supply main was washed away at Scranton, Pa.

Diane came with such destructive force, augmented by bursting dams, that everything in her path was wrecked or damaged. Pavements were torn up. Watermains were ripped out. Highway and railroad bridges were destroyed. Houses and factories were obliterated. Automobiles were tossed around like toys. Worst of all, nearly 200 people were killed.

State health agencies mobilized their personnel immediately and deployed them into the stricken areas. The first arrivals were to make a quick reconnaissance and report on the need for additional assistance, equipment, and supplies.

Mr. Tetzlaff is chief, Headquarters Engineering Activities, Air Pollution Control Staff, Division of Sanitary Engineering Services, Public Health Service, Washington, D. C. At the time of the hurricane floods, he was regional engineer, Public Health Service Region II, New York City, and Mr. Lauster was assistant regional engineer. Mr. Lauster is now sanitary engineer consultant, Health Office, Federal Civil Defense Administration, Battle Creek, Mich. Formerly chief engineer and then deputy director of the Public Health Division, Economic Cooperation Administration Mission to Greece, 1948 to 1952, Mr. Mark is assistant regional engineer in the New York office.

Flood waters carried animal carcasses, garbage, and rubbish through Winsted, Conn., in onrushing tide. Heaps of rubble had to be sprayed with insecticides. The Public Health Service shipped stores of these plus chemicals for rat control to New England from its Communicable Disease Center in Atlanta.

Sunday, August 21, saw the arrival in the Pennsylvania flood area of 55 sanitation personnel from all sections of the State. Health workers in other States responded with similar alacrity.

Public Health Service Assistance

Traditionally, the Public Health Service role in supporting State public health services is entirely supplementary, filling in where other health services are lacking or in need of reinforcement.

The first Public Health Service personnel were dispatched from Region II in New York City on Saturday, August 20. By Friday, August 26, the maximum complement had been assigned to disaster-aid duty. In some instances, selected personnel completed special assignments and withdrew. Other specialists were assigned later. All told, 45 Public Health Service officers were assigned for flood disaster duty to the State departments of health, the Federal Civil Defense Administration, and the National Red Cross.

Public Health Service sanitary engineers assigned to State health departments in the affected areas assisted in evaluating incoming

reports or in coordinating with the department staff and with the Federal Civil Defense Administration and the Army Corps of Engineers. Some were reassigned to county or local health departments or were deployed in the field as representatives of the State sanitary engineer. These groups functioned as personnel of the State or local health department to which they were assigned, and their authority stemmed from State or local authority.

Several sanitary engineers were detailed to the Federal Civil Defense Administration to appraise damage to sanitary facilities and to determine priority of the cleanup operations. Project applications submitted by local officials to the Army Corps of Engineers for restoration of damaged community facilities were first certified as to public health need by Public Health Service officers under Public Law 875 (81st Cong., 2d sess.). Public Law 875 authorizes the expenditure of Federal emergency funds by the Federal Civil Defense Administration. Accustomed as they were to working with State health departments, it was only natural for public health experts to follow similar procedures in this special assignment and to coordinate disaster activities among the various State, Federal, and volunteer agencies.

Officers assigned to the American National Red Cross appraised damage to individual homes and to other forms of housing. Cash allowances by the Red Cross for restoration of private property were based in large part on the appraisals they made.

To meet the Public Health Service's various responsibilities, the New York office drew on other branches of the Service for temporary duty personnel. The Chicago, Kansas City, Dallas, and Atlanta regions, the Washington, D. C., headquarters, the Robert A. Taft Sanitary Engineering Center in Cincinnati, and the Communicable Disease Center in Atlanta assigned Public Health Service officers to disaster-aid duty in the northeastern States.

Twelve Commissioned Reserve Corps officers on inactive status were called to active duty from the city health departments of Cambridge, Mass., Hartford, Conn., Pittsburgh, and Philadelphia; from the housing rehabilitation project in St. Louis; from Vanderbilt University in Nashville, Tenn.; from the State health departments of New Mexico, Oklahoma, Tennessee, and Virginia, and from the health departments of Caroline County, Md., and Mecklenburg County, N. C.

In New York, the regional engineer and his two assistant regional engineers directed Public Health Service activities in the cleanup. The other engineers on the staff were assigned to emergency field duty.

Interstate Carrier Sanitation

The only direct responsibility of the Public Health Service was for interstate carrier sanitation in the flooded area—the sanitation of water, milk, and food supplies which were used by interstate carriers and which might be affected in any way by the floods. Two sanitation specialists checked the condition of railroad watering points in the flooded areas. Their assignment was to find out from State and local waterworks officials whether supply sources for the watering points were affected by the floods and to notify carriers, by telephone or telegram, about the supplies which were unsafe.

Ten watering points were put on prohibited status until the water was safe for use and the sanitation satisfactory. One watering point was still on prohibited status as late as November 15, 1955. One company supplying ice cream to interstate carriers was placed on prohibited status. That action was necessary because floodwaters had temporarily disrupted the city water supply.

Field assignments for Public Health Service sanitary engineers ran the gamut from liaison with State and Federal groups to the organization and direction of spray crews, garbage disposal operations, and other "feet-wetting" tasks at the local level.

The rehabilitation of the 55 municipal water supplies which were either totally or partially interrupted was handled primarily by State health department personnel and by municipal water departments or by private water companies and their consulting engineers. In this connection, the mutual-aid system of neighboring communities assisting each other, which was set up during World War II, and which has been maintained continuously ever since, was highly valuable.

Shattered, splintered avalanches of debris settled on city streets as flood waters roared through Waterbury, Conn. Food stores and other sources of necessities became inaccessible islands in a sea of wreckage like this.

The State health departments issued "boil water" notices in communities where contamination was suspected or known to exist. Heavy chlorination of the water was practiced. Breaks in the water systems were repaired. The "boil water" notices were in effect until water samples were bacteriologically satisfactory. In many communities the usual gas and electricity were not available for heat, and millions of chlorine (halazone) disinfecting tablets had to be distributed along with emergency supplies of safe drinking water when piped water was not available. For drinking water many communities had to rely on emergency filtration equipment or on water brought in by milk-tank trucks, obtained from individual and school wells located on high ground or from other temporary supplies.

Milk supplies, in general, were not disrupted. The total milk supply was adequate. Raw milk supplies from dairies or pasteurization plants affected by floodwaters or power fail-

ures were diverted and handled through other plants.

Interruptions to sewage treatment and sewer service were not serious. Removal of debris that prevented sewage from flowing in the lines and that caused ponding in some residential areas was the main problem. Floodwaters backing up in a drainage pipe in one sewage treatment plant—the pipe did not have a shut-off valve—caused an estimated $70,000 damage to motors, sludge-heating equipment, and electrical control equipment. The plant itself was not affected by floodwaters overtopping the entrance, but the structures of two activated-sludge tanks, empty at the time of the flood, were damaged. High groundwater caused the tanks to rise.

Water and Sewer Systems

Sanitary engineers detailed to the Federal Civil Defense Administration were assigned to survey and report on the damage and the cost of temporary repairs to water and sewer systems, on the need for removal of debris, and on other sanitation needs of significance.

The following report of a Public Health Service sanitary engineer describes a typical situation encountered.

"Since none of the small towns I visited had either a water commissioner or a sewer superintendent, and only one had a city engineer (who had nothing to do with streets or utilities), the mayors or councilmen, usually laymen, needed engineering assistance and guidance. One seriously damaged small community which I visited 2 weeks after the flood had seen no public officials from the outside. They were trying to help themselves by renting heavy machinery for cleanup at a cost of $600 per day, with no assurance as to how the rental fee was to be paid."

Public Health Service survey reports were used by FCDA in processing the applications submitted by communities for reimbursement under Public Law 875. About August 28 word was received that Army engineers had been instructed to move into the flooded areas and to award contracts for rehabilitation work.

Survey work continued as before, with the Public Health Service turning over its reports to the Army Corps of Engineers. Consultation with the corps, relative to the protection of public health, produced gratifying results. One Army coordinator observed that a Service representative should advise every Army area on public health measures.

Much of the work involved supervision of the proper disposal of garbage and refuse, spoiled meats and foods, and other putrescible matter. Prolific fly breeding was found in many places. It was feared that the rat populations would increase in dump areas if some control were not exercised. Some of the dumps were visited by as many as 1,000 trucks a day, hauling spoiled foodstuffs and other debris. Arrangements were made to have bulldozers cover the debris, and, when this was impossible, to have the material sprayed with DDT. Malathion was used on flies reported to be resistant to DDT. Rat control measures were taken in some areas.

Approximately 1 square mile in downtown Woonsocket, R. I., was badly damaged by floodwaters of the Mill and Blackstone Rivers. Debris and mud settled heavily in the section, an area occupied by about one-tenth of the population of Woonsocket, or approximately 4,000 to 5,000 people. The tenement-type structures in the heavily populated section often had stores on the first floor.

A Service engineer detailed to the Rhode Island State Health Department was assigned to direct the disposal of all wastes in the damaged area of Woonsocket. Because the space for disposal was limited, combustible material was separated from organic material and then burned—flame throwers were used to start the burning of wet combustible material. Organic material was dumped in landfills. In all, 45,000 cubic yards of refuse was burned, and 2,300 cubic yards was covered with earth.

In Waterbury, Conn., Service personnel assisted in the cleaning and decontamination of flooded restaurants and bars. Their work soon extended to barber shops, soft-drink bottling companies, meat-packing plants, and railroad freight-cars. Washing and chlorine rinse were considered adequate in most cases. Disinfection by gas was recommended where necessary and practicable. Laundering or dry cleaning was suggested for linens and upholstery.

About 35 Federal food and drug inspectors were sent out to look for contaminated food and to supervise its destruction. The inspectors investigated the chance that prescription drugs might have been swept into the open where they could be picked up.

Much of the equipment and materials for conducting sanitation operations were available generally because the stricken areas were near sources of needed supplies. Thus, fortunately, chlorinated lime, insecticides, chlorinating equipment, pumping equipment, bulldozers, and draglines were available. In addition, the Public Health Service contributed power sprayers, hand-pressure sprayers, warfarin rat-bait concentrate, malathion fly-control concentrate, DDT concentrate, red squill rat-bait pellets, halazone tablets, typhoid vaccine, tetanus antitoxin, and penicillin.

Housing sanitation criteria developed by Public Health Service officers in cooperation with the local health officers determined when homes could be reoccupied. Local personnel were trained in consistent interpretation of the criteria.

Before residents were permitted to return to their homes, building inspectors checked the structural safety of each damaged building. Emergency sanitarians inspected each home to see that there was no water in the cellar and that the mud and silt had been removed; that there was no excessive dampness; that a water supply was available; that at least one sink and one water closet were in operation; that sewer lines were open; that walls, floors, and ceilings were clean and did not present any hazards; that electric wiring and fixtures were safe and satisfactory; that stoves and furnaces were clean and ready for use; and that fire hazards had been removed.

In general, officers returning from flood duty felt that local, part-time health departments lack the facilities, personnel, and funds to cope with emergencies. Their reports revealed that full-time health departments are far better equipped and have the trained personnel needed for these situations; that lessons learned over the years relative to the germ theory of disease may result in the condemnation and waste of large quantities of slightly soiled but salvageable articles; that trained public health personnel, properly organized and deployed, will produce manifold dividends in a crisis; that there is need for carefully developed plans for disaster-aid operations in which administrative lines and duties are well defined; and that close organization is needed at the top of any emergency service.

Nothing can substitute for training and experience in an emergency of this proportion.

Close and friendly cooperation between the Public Health Service, the State departments of health, the Army Corps of Engineers, the Federal Civil Defense Administration, and the American National Red Cross emphasized methods for producing results by the teamwork that was shown. Public Health Service personnel were highly complimentary of the manner in which these organizations carried out their responsibilities. There were, naturally, many misunderstandings, particularly during the initial phases of the operation, but these were ironed out as time went on and as understanding increased. These "growing pains" should serve as lessons, and the knowledge gained therefrom should be used to guide operations in future emergencies of this kind.

Insured Group Medical Care

A detailed picture of the 174 plans using group practice in providing their membership with benefits is described in a report entitled "Group Practice Prepayment Plans: 1954 Survey," by Agnes Brewster, Division of Research and Statistics, Social Security Administration, appearing in the June issue of the *Social Security Bulletin* (vol. 19, pp. 3–11). A general account of all independent medical care and hospitalization plans made by the Social Security Administration in 1954 appeared in the April 1955 *Bulletin*.

Sponsored by consumer groups, unions, fraternal organizations, employer and employee associations, and physicians, these benefit plans give coverage to 3 million members located in 34 States and the District of Columbia. Differences in the plans range from diagnostic services only to the full range of physicians' and specialists' services and hospitalization.

The article delineates the benefits of the plans, together with the methods of financing them. Included are widely or infrequently used physicians' services, obstetricians' and surgeons' services, routine laboratory and X-ray examinations and treatment by X-ray, basal metabolism tests, electrocardiograms, physiotherapy, appliances, extent of provision of ambulance services, and inclusion of pharmacies.

Some plans are fully prepaid; others made extra charges at the time of receipt of services, and still others are at cost.

The various methods used by the group practice plans in providing hospital care include ownership of hospital, contracting with hospitals in the community, cash indemnity benefits, and arrangements with Blue Cross or insurance companies completely separate from the plan. Days of hospital benefit range from 30 to 365.

Health Activities to Combat Flood Damage

—Bucks County, Pa., Experience—

By MELVINA F. PALMER, R.N., M.P.H.

DURING and for several weeks after the flood caused by Hurricane Diane on August 19, 1955, the Bucks County (Pa.) Department of Health served in four general ways: coordination and direction, sanitation services, antityphoid inoculations, and other medical and nursing services including health education.

The county health director, as medical coordinator of the Bucks County Civil Defense Organization, acted as the medical adviser during the declared state of emergency. He directed and coordinated the health activities of the county, working with many local groups and agencies as well as with several national disaster relief groups. He also cooperated with the regional flood headquarters of the Pennsylvania State Health Department, temporarily established at Easton.

It is difficult to convey the meaning of "directed and coordinated" health activities during such an emergency, which affected the full length of the county bordering the Delaware River and the extensive lowlands along the snakelike path of Neshaminy Creek. It meant working around the clock for days, with the barest minimum of sleep and personally reviewing the flooded areas with civil defense and United States Army engineering groups. It meant keeping constant contact with local officials and being at the receiving and calling end of the telephone and short wave radio for information upon which to base decisions, to answer multitudinous questions, and to give directions.

It included hauling typhoid vaccine and providing tetanus antitoxin and other biologicals requested for the protection of hundreds of flood relief workers exposed to injury and negotiating for school buses to transport child evacuees from the Delaware Island camps to their homes instead of to an evacuation center as first proposed. (This same evacuation center was commandeered only a few hours later for an entire flooded town.) It meant coordinating health activities in the face of hysteria and establishing and maintaining an intramural communications system so that the staff could be quickly mobilized for work in areas of acute need. For example, there was the setting up of nursing services in the evacuation center in the high school at New Hope and the setting up and running of 2 typhoid vaccine clinics on Sunday night in 2 firehouses because of the demands of frightened people.

Demands upon the energy, tact, and technical skill exercised by the entire staff did not cease when the water subsided. Instead, the demands increased in diversity and magnitude. It was well into October before the normal activities of some phases of the health department program could be resumed.

Miss Palmer is director of public health nursing, Bucks County Department of Health, Pennsylvania.

Sanitation

The debris laden waters of the Delaware and the Neshaminy caused widespread health hazards in the affected areas. Chief among these

was the contamination of basic food and water supplies. The Bucks County Department of Health prepared and distributed information on practical ways of re-establishing safe water and food supplies and of disposing of spoiled and contaminated items. The three sanitarians devoted much of their time for many weeks to testing samples from private and community wells in the flooded areas and to giving detailed instructions on decontamination. Approximately 800 samples were taken and tested by the 3 men. Technical advice was also given on the proper disposal of waste, the care of food, the disinfection of water-soaked buildings, the disposal of spoiled foods and dead animals, and insect and rodent control. An emergency courier service for daily transportation of water samples was provided by the American Red Cross Motors Corps so that results of tests could be more quickly obtained.

Location of clinics, number and percentage of persons receiving one, two, or three antityphoid inoculations including those reported as being given by private physicians, Bucks County, Pa., 1955

Clinic location	Number inoculations			Total
	1	2	3	
Along Delaware River				
Riegelsville [1]	972	272	994	2, 238
Upper Black Eddy	355	103	621	1, 079
Erwinna	58	42	241	341
Point Pleasant	72	59	185	316
Lumberville	117	47	178	342
New Hope	1, 025	293	1, 415	2, 733
Yardley [2]	1, 821	975	1, 734	4, 530
Morrisville	176	136	299	611
Along Neshaminy Creek				
Edison	46	45	94	185
Neshaminy [1]	391	267	686	1, 344
Lower Southampton [2]	2, 916	408	1, 344	4, 668
Hulmeville [2]	434	137	333	904
Eddington [1]	29	274	265	568
Newportville [1]	23	116	118	257
Croydon [1]	1, 016	186	221	1, 423
Physicians' offices	361	128	351	840
Total	9, 812	3, 488	9, 079	22, 379
Percentage	44	16	40	100

[1] The Bucks County Department of Health procured vaccine, provided registration cards, and assisted between and after clinics with registration and organizing of data. [2] The first inoculations were started by such groups as the Lady Garment Workers mobile unit, the Burholme and Trevose rescue squads, and at Yardley, the Byberry medical staff.

Typhoid Inoculations

To prevent typhoid and to alleviate fear of the disease among large numbers of persons, the county health department participated in the administration and coordination of typhoid inoculations in 15 locations. A total of 44,025 inoculations were given. Only 40 percent of those receiving their first inoculations completed the series of three (see table).

The first clinics started on Sunday, August 21. Lights and sterilizers were run by emergency generators. The director, working quickly and closely with the several sources of supply, including the armed services, obtained the necessary vaccine. The syringes and needles, fortunately, were in adequate supply in the health department, having been obtained for the Bucks County cooperative Salk vaccine program. But equally important were teams of school and community nurses who assisted

Potable water is drawn from trucks located in key areas of Winsted, Conn. The Public Health Service assigned 45 technicians to stricken areas. Emergency field testing (bacteriological and chlorine residual) determined whether natural sources of water were safe or polluted.

Flood destruction leaves in its wake silt, seepage, and possible contamination of all water supplies. The Public Health Service supplied 2,000 membrane filter packets containing equipment for testing and sterilizing well water in a New England area.

with the typhoid inoculations. They had already established a pattern of teamwork in mass inoculations through their experience in the spring and summer with the Salk vaccine program.

Associated with the inoculation program was the unromantic task of preparing registration cards and the seemingly endless job of alphabetizing and sorting. Many volunteers and employees worked day and night to keep this important aspect of the inoculation program flowing smoothly at the 45 clinic sessions. In the county office there is a register which lists most persons who received inoculations.

Health Education

A fourth area of service provided by the county health department was the provision of public health information for residents and physicians. Four telephones, two in addition to those regularly provided, were in constant use for days. In addition, short wave radio from the civil defense office was used for sending important messages. Telephone queries related to water, sewage disposal, typhoid inoculations, as well as a multitude of health and sanitation problems. A physician, an epidemiologist from the Public Health Service, came in for a few days to help relieve profes-

sional persons in answering technical questions.

The county newspapers and commercial radio stations cooperated in the dissemination of information on the above subjects. This information (see below) was also mimeographed and 30,000 copies were circulated in the flooded areas by Red Cross couriers, the health department staff, and civil defense workers, since few of the flood victims had regular channels of communication available to them.

HEALTH PRECAUTIONS FOR FLOODED AREAS

issued by

BUCKS COUNTY DEPARTMENT OF HEALTH

72 N. Main Street, Doylestown, Pa.

August 1955

Prirate water supplies—Boil all water 20 minutes before using. If you have no facilities for boiling water add ¼ teaspoon of household Clorox (10 drops) per gallon of water. Stir vigorously, let stand for 15 minutes. Fill glass half full of this water, cover with hand, shake, and smell palm of hand. If you can smell chlorine, water is all right. If no odor, add 10 more drops and repeat process. Zonite, H.T.H., Diversol, B.K., Pittchlor, or any other common household bleach can be used. Follow directions on container. Continue to use these instructions until you know your water supply has been made safe.

Wells—Open-top dug wells should not be disinfected because they are always dangerous and easily subject to reinfection.

Shallow driven wells should not be disinfected since they are dangerous and subject to pollution (shallow meaning up to 30 feet in depth). If the well was tested and found unsafe prior to the flood, disinfection will be of no value. If the well was tested and found safe prior to the flood the well can be disinfected and restored to its original good condition.

Method of disinfecting well—Wells of ordinary size may be disinfected by the following means: Empty one-third of the contents of a 1-pound can of chloride of lime into a metal or stoneware bucket. Add a small amount of water to this and stir, thoroughly breaking up all lumps until a smooth thin paste is obtained. Add from 1 to 2 gallons of water to this paste and stir well. Allow to settle for a couple of minutes and empty contents into the well. It is not necessary to put all of the lime settling in the bottom of the bucket into the well. Add 2 more gallons of water to the remaining lime in the bucket; stir, allow to settle, and pour into the well. It is important that the disinfecting solution mix with the water in the bottom of the well.

Disinfecting homes, cellars—If chloride of lime is available, it is well to wash down all walls which have been flooded with a solution of chloride of lime. Wherever possible it is also well to whitewash all walls which have been subjected to flood waters. Cellars which remain damp and any other places which might indicate need may be sprinkled with hydrated lime.

Disinfecting home furnishings—All clothing, bedding, and other similar materials may be disinfected with chloride of lime solution or by boiling. The chloride of lime solution will act as a bleach on colored materials. Other materials which cannot be treated without injury with chloride of lime solution should be washed with soap and water and exposed to sun and air for several hours. In disinfecting by boiling, the actual boiling time should not be less than 20 minutes. In disinfecting with the chloride of lime solution, the article should be immersed or covered with the solution of strength so that the chloride odor is noticeable and kept immersed or covered for a period of 30 minutes before washing, rinsing, and drying.

Food for private consumption—All foods touched by flood waters, except canned goods, and all frozen foods which have lost refrigeration should be destroyed. Canned foods which have not been damaged are usually safe for consumption, but it is important that the outside of containers be sterilized before opening by dipping or washing container in chloride of lime solution, (not too strong) and then used only after having been thoroughly cooked.

Food for sale—The sale of foods damaged by flood waters is regulated by the bureau of foods and chemistry of the Pennsylvania Department of Agriculture.

To dispose of human waste—All washed-out privies and cesspools should be filled in. To make a temporary disposal unit, dig a trench 6 feet long and 1 foot wide. Place a blind around it. After each use cover the deposit with some earth. At the end of the day sprinkle it with chloride of lime.

Cover with earth. When the trench is nearly filled, stop using it; fill with dirt, mounded, and stamp firmly.

To dispose of garbage, spoiled food, or dead animals—Excavate a shallow pit about 2 feet deep. Use a bulldozer, if you have one. Dump in the material to be disposed of, almost to the ground surface. Compact it as best you can. Dig another pit beside it, and use this excavation to cover the first pit. Use at least 1 foot of dirt as cover. Burying refuse is better than trying to burn it, since it will be wet and will not burn.

Histoplasmosis Conference

By MICHAEL L. FURCOLOW, M.D.

DURING the 20th century, histoplasmosis has emerged from obscurity more rapidly, perhaps, then any other disease. Formerly known as a rare and fatal malady, it is now seen with great frequency, and estimates are that in the United States alone 30 million people have been or are now infected. More remarkable than late recognition of the disease, however, was the discovery that it is caused by a fungus, since the fungi were described and connected with disease half a century before the role of the smaller bacterial agents was discovered.

With the realization that this disease occurs frequently, its study has advanced on many fronts. Mycologists, serologists, epidemiologists, clinicians, pathologists, and even general biologists have contributed to this relatively recent accumulation of knowledge.

With knowledge advancing, it is obvious that some fields develop faster than others, and that knowledge and achievements in certain areas may not be generally available to all interested persons. With this thought in mind, the Communicable Disease Center of the Public Health Service in 1952 sponsored a histoplasmosis conference which was attended by 48 persons interested in the study of this disease. The purpose of the conference was "to take stock of our accomplishments and consider the possibilities of the future." Sixty papers were presented in five sessions. Fourteen papers dealt with clinical, epidemiological, and pathological aspects of histoplasmosis; 13 dealt with mycological aspects; 12, with serologic diagnosis; 9, with the skin test as an epidemiological tool; and 12, with natural reservoirs of the fungus.

Dr. Furcolow is chief, Kansas City Field Station, Communicable Disease Center, Public Health Service, Kansas City, Kans.

Public Health MONOGRAPH

No. 39

The accompanying discussion covers some of the findings presented in Public Health Monograph No. 39, published concurrently with this issue of Public Health Reports. The conference was sponsored by the Communicable Disease Center, Public Health Service, Atlanta, Ga.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Proceedings of the Conference on Histoplasmosis held at Excelsior Springs, Mo., November 18–20, 1952. Public Health Monograph No. 39 (Public Health Service Publication No. 465). 319 pages. Illustrated. U. S. Government Printing Office, Washington, D. C., 1956. Price $2.00.

To preserve these papers in a single volume for future investigators, the proceedings of this conference are being published as Public Health Monograph No. 39, with a complete, up-to-date bibliography of nearly 800 references.

Here for the first time is summarized for the student most of the current knowledge of this intricate and interesting fungus disease. Here also are presented the baffling problems of the geographic localization of the disease and its apparent relationship to natural reservoirs of the fungus.

The clinical picture, with its variability from asymptomatic infection to bilateral chronic cavitary disease resembling tuberculosis, is also illustrated. The occurrence of epidemics is stressed. The usefulness of the skin test and serologic tests in diagnosis and epidemiological studies is reported. In addition to the difficulties of diagnosis, there are presented such public health problems as the prevention of a disease transmissible from nature rather than from other human or animal hosts, and the lack of adequate therapeutic measures. All of these things serve to point up one of the purposes of the conference, namely, to furnish guidelines for future research.

For the student of histoplasmosis, it is interesting that the most important advances since the conference have dealt with the increasing awareness among clinicians of the prevalence of this disease. Especially is this true of chronic cavitary histoplasmosis as a problem in tuberculosis sanatoriums. In addition, advances have been made in pathological diagnosis by the use of special stains. An example is the Gridley stain, which has enabled pathologists to evaluate the frequency of histoplasmoma among patients undergoing surgery for suspected cancer of the lung. These refinements in pathological technique have supported the specificity of the skin tests reported during the conference.

Since the recognition of the prevalence of this fungus disease, there has been growing interest among clinicians and laboratory personnel in systemic fungus infections in human beings. This interest has resulted in increasing numbers of reports of infections with fungi previously considered rare or nonpathogenic.

In summary, it appears that this accumulation of knowledge of histoplasmosis may have many applications by public health workers, physicians, laboratory workers, and many others.

Advisory Committee on Indian Health

An Advisory Committee on Indian Health to assist in the improvement and expansion of medical care and health services to American Indians was appointed by the Public Health Service in May 1956.

The nine-member council will evaluate the Service's new Indian health program and assist in developing operating policies. They are N. B. Johnson, chief justice of the Supreme Court of Oklahoma; Anna Wauneka, chairman of the Navajo Tribal Council's Health Committee, Window Rock, Ariz.; Frank Ducheneaux, chairman of the Cheyenne River Sioux Tribal Council, S. Dak.; and Robert B. Atwood, editor and publisher of the *Anchorage Daily Times*, Anchorage, Alaska.

Also on the committee are Dr. Robert Neff Barr, secretary and executive officer of the Minnesota State Board of Health, Minneapolis; Dr. Fred T. Foard, director of the division of epidemiology, North Carolina State Board of Health, Raleigh; Dr. Alexander H. Leighton, professor of psychology, School of Industrial and Labor Relations, Cornell University, N. Y.; Dr. James Perkins, director of the National Tuberculosis Association, New York, N. Y.; and Dr. Raymond F. Peterson of Butte, Mont.

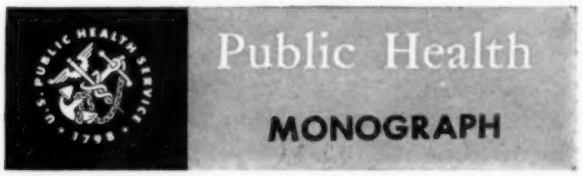
Sampling Plan for a Small Household Survey

Whether older persons would enter the labor force, if they could, is a question with many complications. In a study conducted in Hagerstown, Md., the Division of Public Health Methods of the Public Health Service attempted to develop an interview to determine the degree of interest in working among older people and the extent to which poor health might be an obstacle to their employment.

This monograph deals with the sampling aspects of the study and presents in more than the usual detail the decisions that had to be made and the procedures finally followed in sampling for a household survey. The methods used in estimating sampling error from the survey results are also set forth. Subsequent papers will cover the evaluation of the interview schedule, analysis of scales of availability for work in the Hagerstown trial, and the illness among older persons in the city as revealed by the interview.

The requirements of the study which chiefly determined the sample design were: (*a*) the need for a probability sample of all persons 45 years of age and over, exclusive of those in resident institutions, living within the city limits of Hagerstown; (*b*) the need for a sample of sufficient size to permit the analysis that was contemplated; and (*c*) the undesirability of conducting more than one interview in any one household.

When we employ probability sampling we can say in advance how much sampling error we are willing to tolerate and then select the sample so that statistical conclusions about the characteristics of the whole population will not have a sampling error greater than the tolerable limits, except very rarely. Probability sampling requires that the probability of including any individual in the sample be known. In order to accomplish this, it is necessary to have some sort of list of all the individuals, or of units including all of the individuals, in the population that is to be sampled. In Hagerstown, this list was supplied by the city directory and a city map.



No. 40

The accompanying summary covers the principal characteristics of the sampling plan for a small household survey described in Public Health Monograph No. 40, published concurrently with this issue of Public Health Reports. The author is a biostatistician with the Division of Public Health Methods, Public Health Service.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Woolsey, Theodore D.: Sampling methods for a small household survey. Public Health Monograph No. 40 (Public Health Service Publication No. 480). 16 pages. Illustrated. U. S. Government Printing Office, Washington, D. C., 1956. Price 20 cents.

The bulk of the sample was obtained by selecting what is known as a systematic sample of addresses from the directory.

Since directories are out of date as soon as they are issued, it was known that the sampling from the directory would have to be supplemented to allow a chance for households living at addresses not listed in the directory to come into the sample. This was managed by selecting a sample of blocks from a listing of all city blocks made up from a map of the city. Each block falling into the sample was canvassed, and all addresses were carefully checked against the directory. Any address in one of these sample blocks that was not listed in the directory was included in the sample. Finally, one area of the city where there had been a substantial amount of new construction was treated separately. All addresses in this area were listed and a sample was drawn.

Thus, the probability sample was carried out by dividing the addresses in the city into three strata: directory addresses, unlisted addresses scattered throughout the city, and unlisted addresses concentrated in new construction areas. An account is given in the monograph of the sampling in each of these three strata. Some unexpected obstacles were encountered, and the method of overcoming these is described.

The objective of obtaining a sample of sufficient size to support the desired analysis was achieved partly by guesswork and partly by providing a safeguard in case the guesswork was poor.

It had been decided, for reasons that will be presented later, that only one person 45 years of age or over could be interviewed in each household. The question was: In what proportion of the Hagerstown households would one or more persons who were past the 45th birthday be found? There were no available statistics on this point, but a guess was made that this proportion would be 50 percent. Since 500 completed interviews were thought to be a minimum number necessary for the analysis, it appeared that a sample of 1,000 households would be required to produce 500 households containing one or more persons 45 years of age or older. As a safeguard, however, it was decided that three separate samples of 500 households each should be selected. After the interviewing in each sample had been completed, it would be possible by hand tally methods to determine not only how many completed interviews were available but also how large some of the frequencies that were important for the analysis would be. If a larger sample appeared to be needed, it was merely necessary to proceed with the interviewing of an additional sample of 500 households.

The population of Hagerstown in the 1950 census was 36,260; the number of households, approximately 11,400. To make allowance for inability to interview some persons, a sampling ratio of 1 in 21 for each of the three samples was decided upon. This ratio could be expected to provide 540 or more households in each sample. As it turned out, 56 percent of the households contained one or more persons 45 years of age or older. Consequently, it was found possible to stop the interviewing after the completion of the second sample.

Many of the questions in the interview were of a type that could be answered properly only by the person whom the question concerned. In other words, a proxy respondent could not be accepted. It was believed, however, that, if more than one person 45 years of age or older were to be interviewed in any one household, the replies of the later respondents would be influenced by overhearing the earlier interviews. It was, therefore, a requirement of the study design that a single respondent 45 years of age or over be selected from among those in this age group in the household. Furthermore, in order to meet the probability sample requirement mentioned earlier, the single respondent must be selected in such a way that the probability of any given individual coming into the sample could be known. In other words, the interviewer must be allowed no freedom in the selection of a respondent from among those 45 years of age or over who were found in the household.

This was accomplished by providing for opening questions to be addressed to any adult who could answer for the household as a whole. The first of these questions (which followed a brief introduction) was designed to find out whether there was anyone in the household who had passed the 45th birthday. If there was not, the interview was terminated. If there was, a complete roster of the members of the household was

obtained as well as certain information about the demographic characteristics and labor force status of each person.

When the household contained only one member 45 years of age or older, all the questions on health and availability for work were addressed to this person. When there was more than one such member, the interviewer was provided with a sampling table which specified which member was to be interviewed in that household. Thus, in households with two persons in the 45-years-or-over class one of the two was selected at random, in households with three such persons one of the three was selected, and so on. In analyzing the results, it was necessary to restore the balance in this sampling by weighting each interview by the number of persons in the household who were in the age group of interest. This was done by reproducing the punchcard that was prepared from the interview, as many times as necessary.

The monograph also presents statistics showing the degree of success which the interviewers had in reaching the sample. Of the total of 1,114 households in which an initial interview was desired, the interviewers completed 1,093 (98 percent). Six hundred fifteen of the households in which an initial interview was completed were determined to have one or more persons 45 years of age or over. The main interview was sufficiently complete to be included in the study in 600 (98 percent) of these. The 600 households contained 1,030 persons 45 years of age or older, but, as has been stated earlier, only one such person in each household was interviewed.

The monograph completes the exposition of the sampling methods employed with an illustration of the method of estimating the sampling errors from the survey results. A table of standard errors for percentages is also presented.

The sampling methods used in the Hagerstown survey are believed to have a wide range of application where the investigative technique is the interview-survey of a population sample.

Institutes in the Care of Premature Infants

A series of institutes for physicians and nurses in the care of premature infants is scheduled for the 1956–57 year at the New York Hospital-Cornell Medical Center. These institutes, which have been held each year since 1949–50, are sponsored by the New York State Department of Health and the United States Children's Bureau. They are designed for physicians and nurses in charge of hospital premature nurseries and special premature centers and for medical nursing directors and consultants in State and local premature programs.

Institutes are scheduled to begin September 17, 1956, November 5, 1956, and January 14, 1957. If the number of applicants is sufficient to warrant them, fourth and fifth institutes will be held beginning March 11, 1957, and early in May 1957.

Attendance at each institute is limited to 6 physician-nurse teams. The program for physicians lasts 2 weeks, and that for nurses, 4 weeks. Participants pay no tuition, and stipends are provided to help cover expenses during attendance. Early application is essential since plans are contingent on the number of applicants.

Additional information may be obtained by writing Box 143, Institute in the Care of Premature Infants, The New York Hospital, 525 East 68th Street, New York 21, N. Y.

Problems in the Use of Tranquilizing Drugs

The tranquilizing drugs, such as chlorpromazine and reserpine, have been heralded as opening a new era in psychiatry.

Although these drugs may have such a potential, many facts are needed to assess the public health and social consequences that may arise from their widespread use. This monograph points to and discusses some major problems posed by availability of these drugs to the psychiatric profession and other branches of medical practice and the types of research needed to assess the effects of these drugs, particularly on mental hospital and outpatient psychiatric practice.

The tranquilizing drugs are being used on persons of all ages to treat not only a wide spectrum of psychiatric disorders but also hypertensive vascular disease and many other conditions. Their significant action is their ability to reduce motor activity, disturbed behavior, tension, and anxiety without producing sleep. The tranquilizing effect has been reported to be of value in the treatment of hospitalized psychotics by diminishing disturbed behavior without preventing patients from continuing to take part in psychotherapy, occupational, recreational and other forms of therapy. However, much research is needed to determine the immediate and long-range effect of the drugs both in psychiatric and nonpsychiatric patients. It is also necessary to establish appropriate dosages in relation to the various characteristics of the patient, such as age, sex, diagnosis, duration of illness, or general physical state.

Because of the tranquilizing properties of the drugs, information is needed on their psychological effects and the characteristics of the individuals in whom these effects are likely to occur. In this connection, the results of several recent studies show a significant incidence of severe depression, with suicidal tendencies in some instances, in persons being treated for hypertensive vascular disease with reserpine and other rauwolfia products. This constitutes a major contraindication to the indiscriminate and un-

Public Health

MONOGRAPH

No. 41

The accompanying note summarizes the principal points discussed in Public Health Monograph No. 41, published concurrently with this issue of Public Health Reports. The author is chief of the Biometrics Branch of the National Institute of Mental Health, National Institutes of Health, Public Health Service.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Kramer, Morton: Public health and social problems in the use of the tranquilizing drugs. Public Health Monograph No. 41 (Public Health Service Publication No. 486). 32 pages. Illustrated. U. S. Government Printing Office, Washington, D. C., 1956.

supervised use of rauwolfia preparations in persons with essential hypertension.

Effect on Mental Hospital Populations

Because of the magnitude of the problem of the hospitalized mentally ill, hospital administrators and public health, welfare, and other governmental officials are interested in finding some way either to reduce first admission rates to these hospitals, to effect a higher turnover of patients, or to keep readmission rates low and thus eventually to decrease the size of the resident populations. The tranquilizing drugs possess some of the necessary properties of an agent that could achieve such results. However, much more information is needed about the processes in society that lead to hospitalization and about the factors in the hospital and in the community that lead to release before any major portion of observed differences can be attributed to the tranquilizing drugs.

Effect on First Admission Rates

Data show that between 1940 and 1950 there had already been striking variations—and, in several instances, reductions—in age-specific first admission rates to State mental hospital systems. It is emphasized that there is a need for much careful epidemiological and social science research to illuminate the facts about "paths to the mental hospital" as well as "the barriers" hospital administrators place between the hospital and the community before one can determine what part the tranquilizing drugs may be playing in the reduction of admissions to mental hospitals.

Effect on Release Rates

Data are presented to emphasize the complexities in interpreting release rates from mental hospitals and also to demonstrate that even prior to the advent of the tranquilizing drugs there had been striking changes in these rates. Questions are raised as to whether increases in release rates that have been occurring over the years are due to (*a*) more intensive use of various psychiatric therapies, (*b*) differences in the kind of risk being admitted now as compared to years ago, (*c*) changes in attitude of staff toward level of improvement expected in patients prior to release, (*d*) administrative factors and staff and patient organization within the hospital, or (*e*) changes in the community's attitude and that of the patient's family toward the mental hospital and the mentally ill.

Because of the large number of variables, well-designed experimental studies are necessary to evaluate therapies singly and in combination with each other and with various ancillary programs. In such studies there must be carefully defined diagnostic groups of patients, appropriate control groups, carefully specified therapeutic plans and staffing patterns, and specific objective criteria for evaluating results of treatment and for determining condition at time of release. The questions about the importance of the tranquilizing drugs on the outcome of treatment emphasize quite sharply the need for clarification of what constitutes psychiatric treatment, and as to what are the objectives of treatment within the hospital setting. If hypotheses with respect to the effectiveness of the tranquilizing drugs in accomplishing the goals of hospital treatment are to be tested, then it is essential that experiments and studies be devised that permit comparison of the effectiveness of a treatment method without use of the drugs with its effectiveness when the drugs are used.

Implications for Staffing Patterns

Not only have the numbers of personnel in mental hospitals been inadequate in relation to the number of patients but the turnover of personnel has also been relatively high. The milieu now made possible in the wards of mental hospitals following the introduction of the tranquilizing agents, namely, a marked reduction in or elimination of motor excitement in patients and in the reduction or elimination of the use of seclusion and restraint, raises serious questions about how existing staffs will have to be retrained and how staffing patterns should be changed, as well as how many additional or fewer personnel will be required.

Followup Studies

The need for carefully designed followup studies is urgent to determine the relationship of

diagnosis, sex, age, length of hospitalization, therapy, and the socioenvironmental factors encountered by patients in the extrahospital world to relapse or successful readjustment. The tranquilizing drugs add further complications. For example: How should dosage levels used in the hospital be modified up to time of release? When the patient is released, on what dosage should he be maintained, if any? What problems does the use of these drugs pose for the family? What information should the family be given? What resources in the community are needed to follow up these patients adequately so as to prevent serious complications from developing in the patient, to detect complications when they have developed, and to take appropriate steps to safeguard the patient, his family, and the community as well as to facilitate readjustment of the patient to the extrahospital world?

Effect on Outpatient Medical Practice

Uses of the tranquilizing drugs have suggested the possibility that relatively inexpensive agents are available that will make it possible to treat many types of psychiatric disorders on an outpatient basis. It has also been suggested that these drugs may reduce the need for psychiatrists in isolated communities where the general practitioner can now treat some of the milder forms of mental disorders. However, the widespread use of these drugs in our current state of knowledge concerning their immediate and long-range effects might also produce conditions that could tax seriously the limited psychiatric resources of the Nation. Some of the possible problems that these drugs may create are considered in relation to the psychiatric manpower of the Nation and the availability of outpatient and other community psychiatric services. It is suggested that administrators of community mental health programs scrutinize carefully the current organization of psychiatric outpatient and inpatient services to determine how they must be modified and reorganized to meet the new demands that may be placed on them by the advent of the age of pharmacotherapy in the psychiatric disorders.

Advisory Council on Vocational Rehabilitation

Mrs. Spencer Tracy, Russel W. Brothers, and Chester W. Haddan were appointed in May 1956 to 4-year terms on the National Advisory Council on Vocational Rehabilitation.

The 12-member council reviews applications submitted by private, nonprofit, or public organizations seeking Federal funds for partial support of research and demonstration projects or of special facilities concerned with vocational rehabilitation problems of nationwide significance.

Mrs. Tracy, president and director of the John Tracy Clinic of Los Angeles, has had long experience with problems of the deaf and hard of hearing. She has been associated with many organizations working on behalf of the handicapped and is the author of numerous articles dealing with hearing impairments.

Mr. Brothers, secretary and treasurer of the M. P. Brothers Co., of Nashville, Tenn., is chairman of the Tennessee Governor's Committee on Employment of the Physically Handicapped and has long taken an active interest in the Tennessee vocational rehabilitation program.

Mr. Haddan, a specialist in the artificial limb field, is president of the Gaines Orthopedic Appliances Co. of Denver, Colo. He is also a member of the prosthetics research board of the National Research Council, the committee on artificial limbs of the American Medical Association's council on physical medicine, and the Colorado Governor's Committee on Employment of the Physically Handicapped.

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